UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF MASSACHUSETTS

WELL-COM ASSOCIATES, L.P.,	)	
Plaintiff,	)	
v.	)	Docket No. 05-10056-JLT
HONEYWELL INTERNATIONAL INC.,	)	
Defendant.	)	

SUPPLEMENTAL DECLARATION OF KERRY TULL

I, Kerry Tull, state, under the penalties of perjury, as follows:

1. As I noted in my prior declaration, the documents on which I relied in forming my opinions included the following:

a. Deposition of Robert Timmons (DRT),

b. Plaintiff's Local Rule 56.1 Statement of Undisputed Facts (PLRSUF),

c. TRC's 1986 Report (TRC),

d. Norwood 1987 Report (Norwood),

e. Various historical maps and newspaper articles (Historical Information),

f. Affidavit of Matthew O'Leary (AMO),

g. United States Army Corps of Engineers, Phase I (USACE Phase I), and

h. Various Rizzo Reports (Rizzo)

2. The facts and data in these documents are of a type reasonably relied upon by experts in my field, environmental consulting.

3. A true and correct copy of item d above is attached hereto.

SIGNED UNDER THE PENALTIES OF PERJURY
THIS 14th DAY OF APRIL 2006.

/s/Kerry Tull
Kerry Tull

CERTIFICATE OF SERVICE

I hereby certify that this document(s) filed through the ECF system will be sent electronically to the registered participants as identified on the Notice of Electronic Filing (NEF) and paper copies will be sent to those indicated as non-registered participants on April 14, 2006.

/s/David B. Chaffin

EXHIBIT A

PHASE III - ENVIRONMENTAL STUDIES

MALDEN, MASSACHUSETTS

SEPTEMBER 29, 1988

ENVIRONMENTAL STUDIES

INTERIM WORK PLAN - DATA ACQUISITION

LOWER COMMERCIAL STREET

MALDEN, MASSACHUSETTS

PREPARED FOR:

MALDEN REDEVELOPMENT AUTHORITY
MALDEN, MASSACHUSETTS

PREPARED BY:

NORWOOD ENGINEERING CO., INC.
1410 ROUTE ONE
NORWOOD, MASSACHUSETTS 02062

File No.: 0065 - 02

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ENVIRONMENTAL STUDIES

Phase III

Interim Data Work Plan

Lower Commercial Street
Malden, Massachusetts

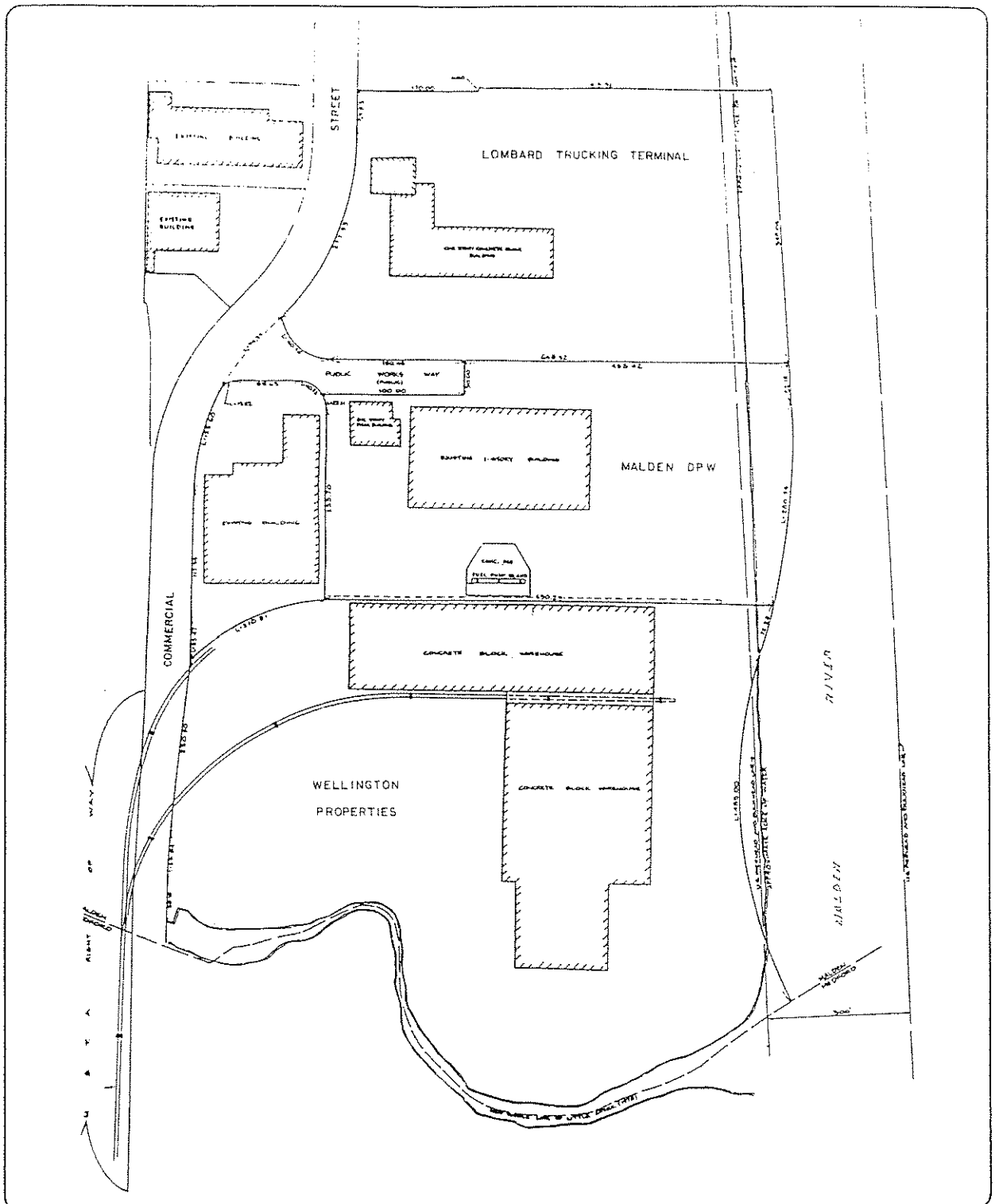
1.0 Introduction

Phase I and II environmental studies were initiated in the Lower Commercial Street area of Malden, Massachusetts in the fall of 1985 pursuant to Massachusetts General Laws, Chapter 21E. The project site for this investigation is a 21.6 acre site comprised of three parcels referred to as the Lombard, Malden Department of Public Works and Wellington properties. A sketch plan of the study area and applicable topographic locus map may be referenced as Figures 1 and 2, respectively. Specific details relative to the results of these environmental studies may be referenced from the following reports entitled:

Environmental Site Assessment
Lombard Trucking Terminal - Malden, Massachusetts
April 1986 - Volumes I and II

Environmental Site Assessment
Malden Department of Public Works Garage
and Wellington Realty Property - Malden, Massachusetts
April 1986 - Volumes I and II

Following a review of these environmental site assessment reports by representatives of the Department of Environmental Quality Engineering, Interim Data Gap Work Plans were submitted to the Department by Goldberg-Zoino and Associates and Norwood Engineering Co., Inc. These work plans were designed to evaluate the applicability of interim remedial measures to address the conditions revealed during previous studies and to obtain further data pertaining to evaluation of the proposed remedial work plan which was submitted to the Department in conjunction with the Phase I and II environmental studies.



SKETCH PLAN OF SITE • MALDEN • MA

figure **1**

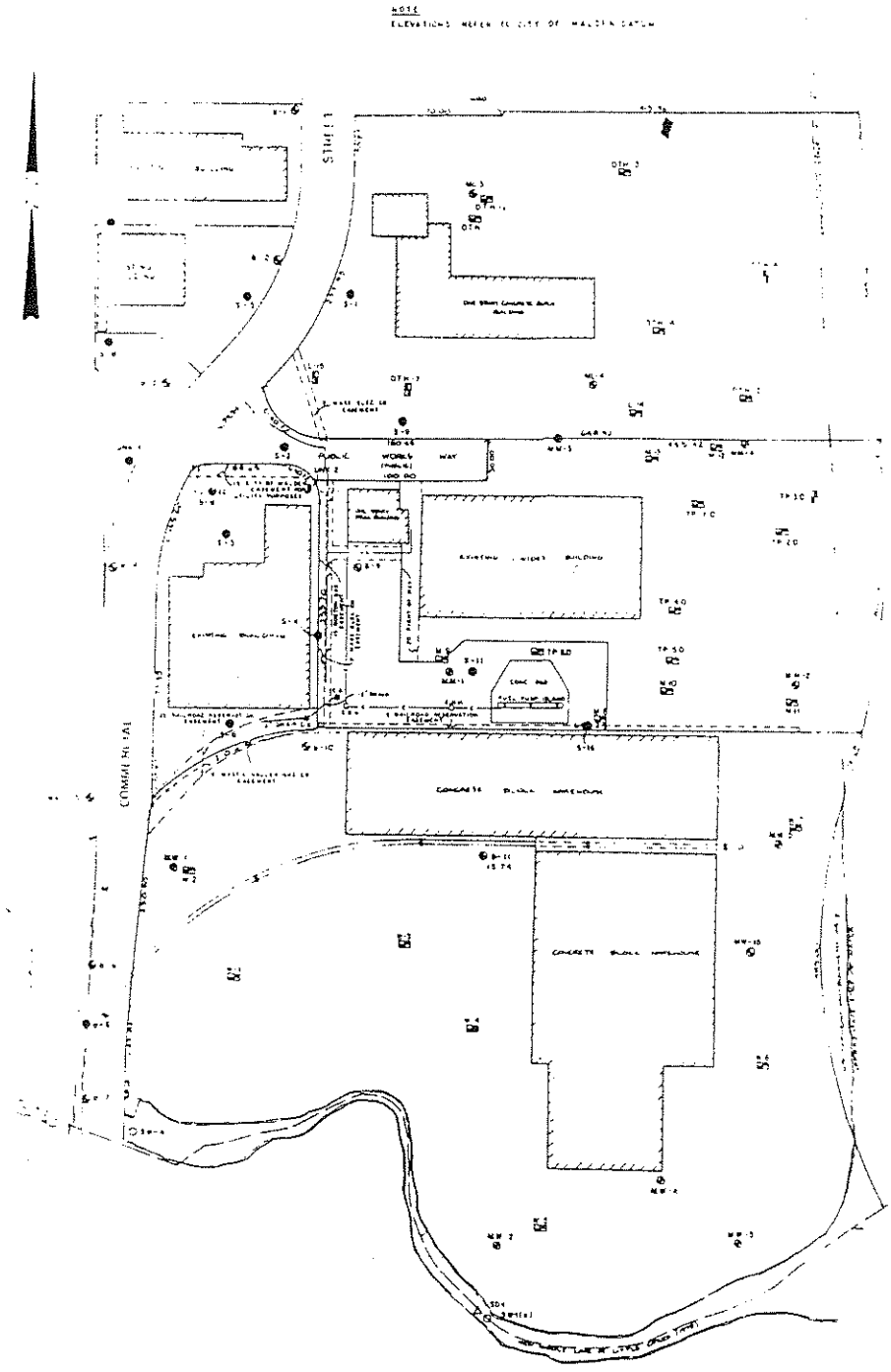
norwood engineering co. inc., 1410 route 1, norwood, ma.

date **MAY 1988**

job no. **0065-02**

MLDN 000582

U.S.G.S. TOPOGRAPHIC LOCUS • MALDEN • MA		figure **2**
norwood engineering co. Inc., 1410 route 1, norwood, ma.	date 1971	job no. 0065-02



SKETCH PLAN OF SITE W/ APPROXIMATE SAMPLING RECEPTORS WITHIN THE STUDY AREA

figure **3**

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date MAY 1988

job no. 0065-02

Upon the completion of initial site activities by TRC and prior to this phase of study, additional site investigatory actions performed by Norwood Engineering included the placement of test borings/groundwater observation wells S-1 to S-13 in portions of the Lombard/DPW property and off-site areas, together with the excavation of test pits 21.0 through 24.0 in the eastern portion of the Malden DPW property. The results of these hydro-geologic investigations are summarized in the Work Plan prepared by Norwood Engineering, which serves as the basis for and is included as Appendix B of this study, and in Appendix F of the initial site assessment for the Lombard property. Due to site access constraints, no further field investigations were per-formed upon the Wellington property prior to the implementation of the scope of work discussed within this summary report. As such, due to the level of assessment previously performed upon the Wellington property and the nature of the conditions encoun-tered, a more detailed scope of field and laboratory activities was performed as a part of this environmental study.

2.0 Field Investigation - Lombard/MDPW Property

A summary of test pit and soil boring locations utilized in the assessment of the 21.6 acre study area and off-site regions is presented on Figure 3. Soil and groundwater investigations initiated by TRC in 1985 identified the possible presence of free fraction oil at the Lombard/MDPW property line. The approximate location of applicable sampling locations of the excavations and additional sampling locations in this portion of the study area may be referenced from Figure 4. To evaluate the possible presence of remediable concentrations of petroleum hydrocarbons in the vicinity of test pit M 13.0, test pit/trench excavations M 25.0 - M 28.0 were placed in the approximate locations delineated on the associated overlay, presented as Figure 5.

Specific details pertaining to the type of materials encoun-tered during each excavation may be referenced from the applic-able soil logs attached as Appendix C. In general, each test pit excavation was observed to contain a variety of miscellaneous fill material over the entire limits of excavation. Following an initial layer consisting of fine to coarse sands and gravel, fill materials ranged from municipal debris, tin cans, bricks, ash, wood, rubber, glass, ceramics at TP M 25.0, to residual ash and substantial amounts of metal strips at TP M 28.0.

As indicated on Figure 5, test pit M 25.0 was placed as a 30 foot trench excavation in an easterly direction commencing at test pit M 13.0. At TP M 25.0, three separate locations within the excavation of the trench cuts were extended to depths in excess of 10 feet to accommodate sampling of the groundwater compartment. A significant variation in observed groundwater levels was noted within the open excavation, reflective of an influence due to in situ geology. Of principle importance was an absence of any recoverable quantities of petroleum hydrocarbons. Test pit M 26.0 was excavated in a westerly direction approximately

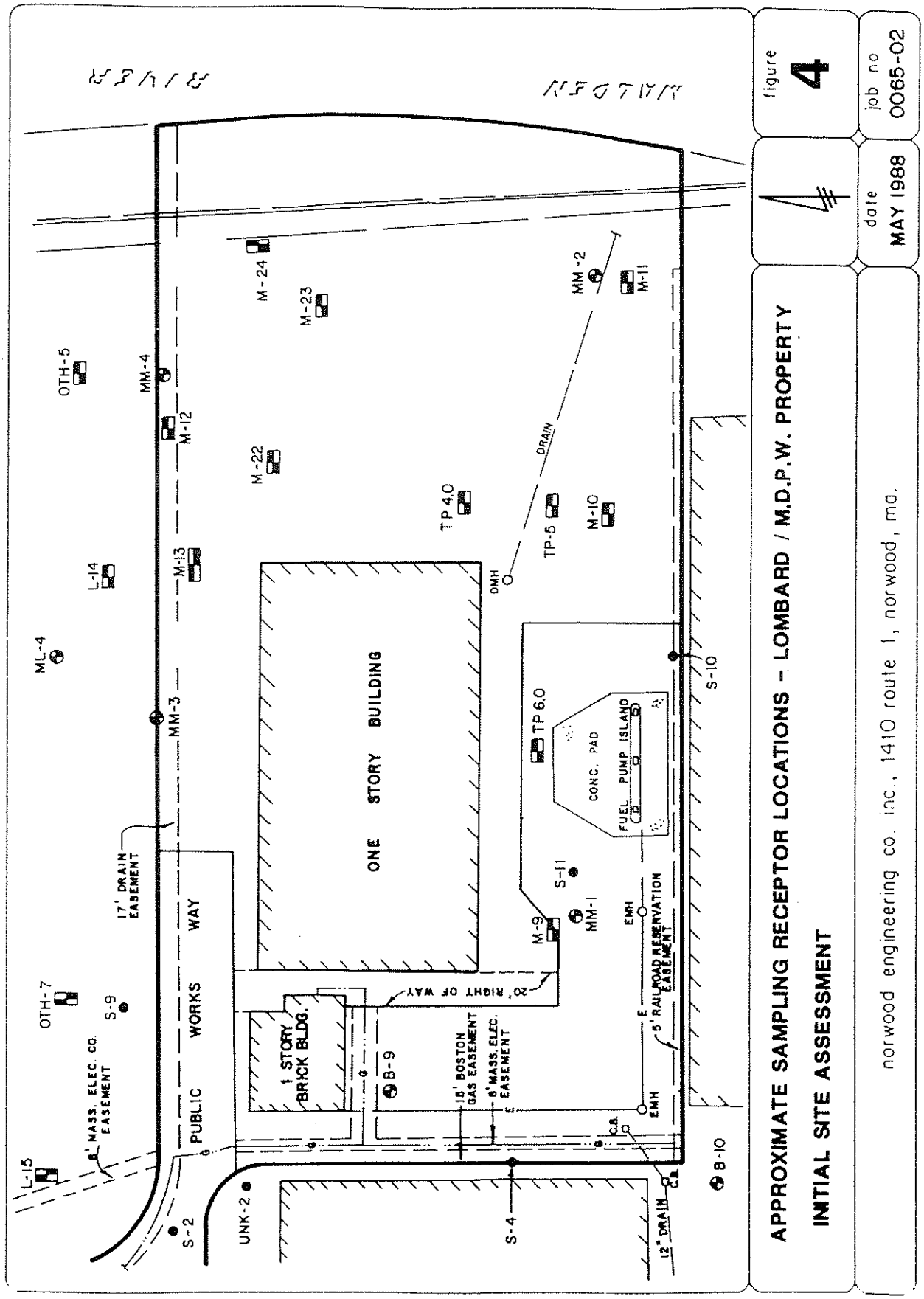

figure 4

date MAY 1988

job no 0065-02

APPROXIMATE SAMPLING RECEPTOR LOCATIONS - LOMBARD / M.D.P.W. PROPERTY

INITIAL SITE ASSESSMENT

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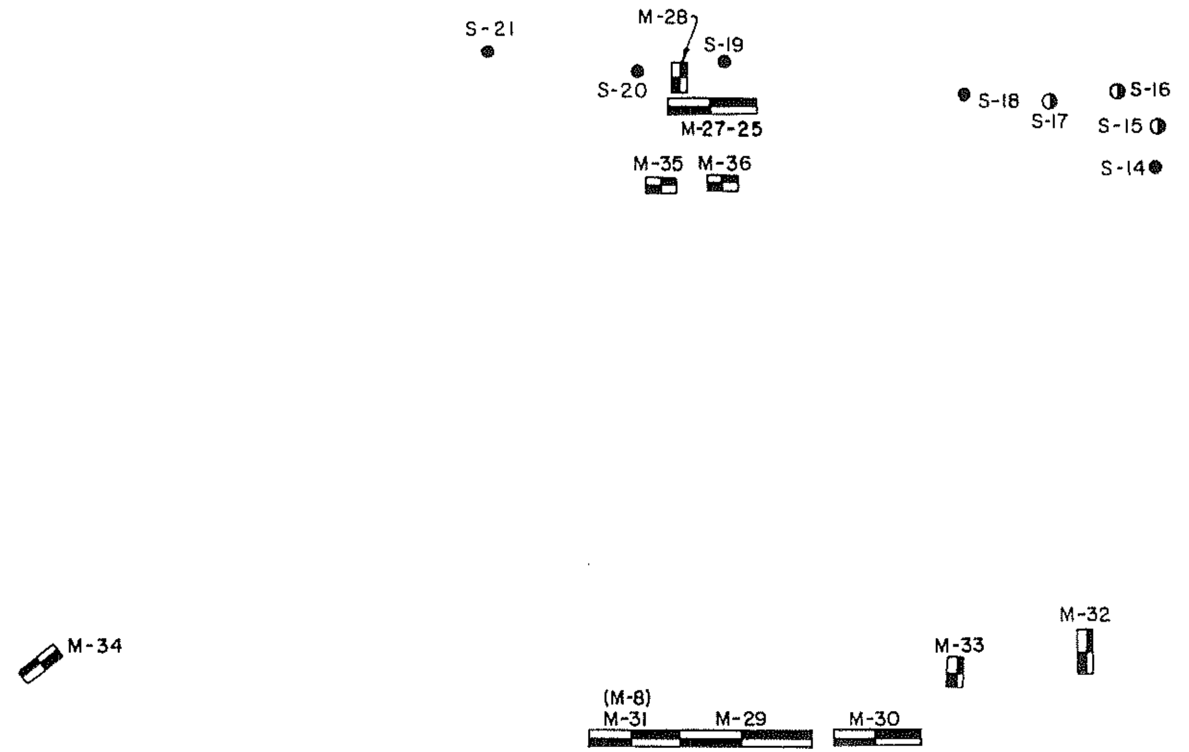

APPROXIMATE SAMPLING RECEPTOR LOCATIONS – LOMBARD / M.D.P.W. PROPERTY

INTERIM DATA STUDY – 12/87

figure **5A**

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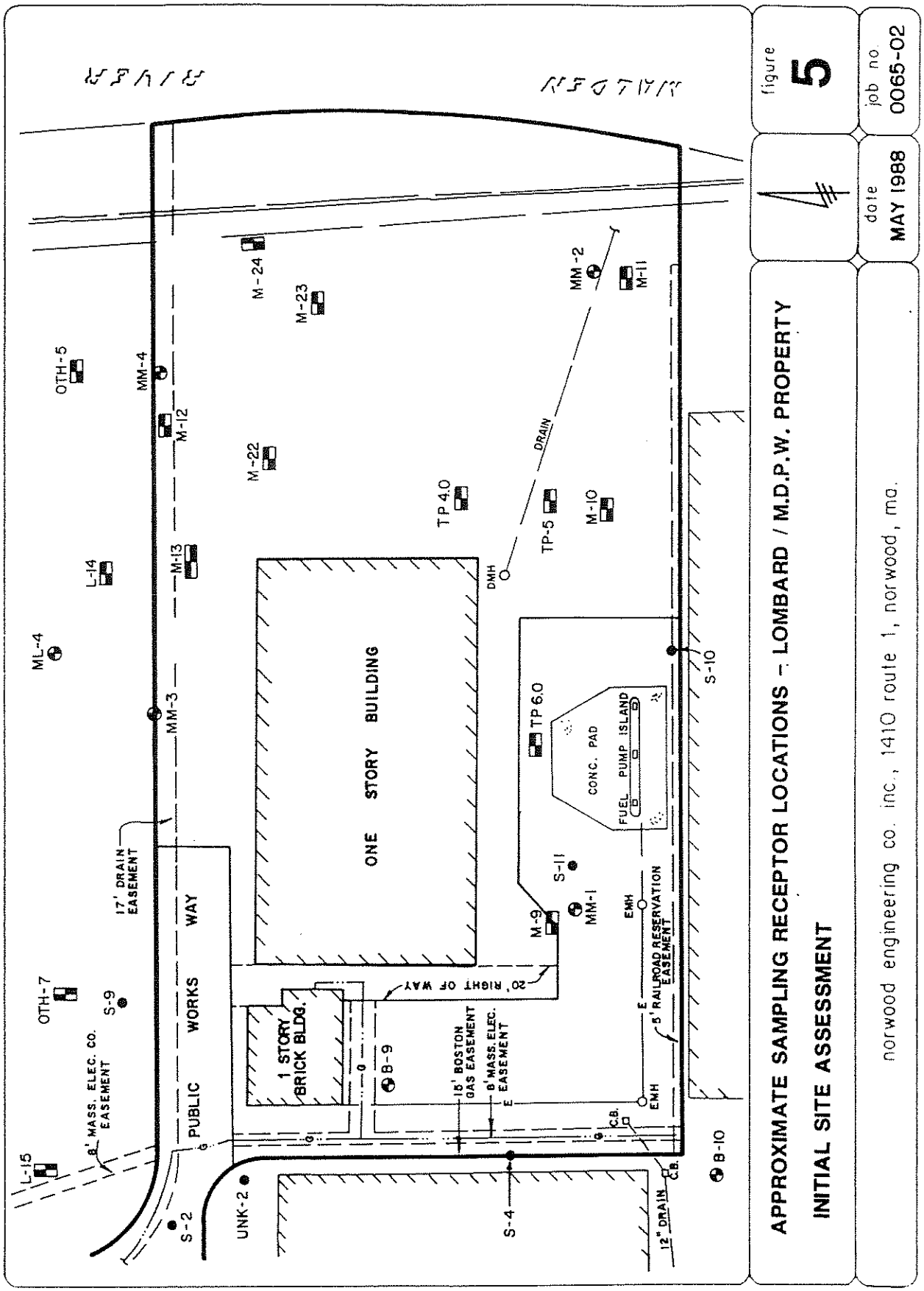
date **MAY 1988**

job no. **0065-02**



APPROXIMATE SAMPLING RECEPTOR LOCATIONS – LOMBARD / M.D.P.W. PROPERTY

INITIAL SITE ASSESSMENT

figure 5

date MAY 1988

job no. 0065-02

norwood engineering co. inc., 1410 route 1, norwood, ma.

5.0 feet from the edge of TP M 25.0 for a distance of 8.0± feet and to a depth of 8± feet. Materials observed included a predominance of metal strips, crushed 55 gallon drums, rubbish scrap and bottles. The fill material encountered in this test pit excavation appeared to be of more recent source origin in comparison to the materials encountered at TP M 25.0. In particular, in addition to newspaper remnants dated December 14, 1938, the evaluation of fill material from the center cut of TP M 25.0 revealed a significant fraction of shoes and leather materials.

TP M 27.0 was extended for a distance of 8 feet as a westerly continuation of the excavations commenced as TP M 25.0 and revealed municipal fill materials as well as indications of a past burning dump in this portion of the project site. Significant accumulations of municipal debris and strips were also encountered during the excavation of TP M 28.0.

Each of the test pit excavation placed in the proximity of TRC test pit M-13 revealed visually identifiable indications of petroleum hydrocarbons. However, the profiles observed were reflective of residual hydrocarbons that had been adsorbed by in situ soils and subsequently released during excavation. Furthermore, a significant variation in shallow groundwater levels was observed reflecting an influence upon contaminant migration due to in situ soil/sediment conditions. This was most noticeable during the trench excavations performed as TP M 25.0, where groundwater levels within three different segments of the trench exhibited fluctuations in excess of 1.0 feet in depth. At test pit M 27.0, petroleum fractions exhibited a clotting or agglomeration factor, in contrast to the more prevalent indications of a sheening observed at the soil/groundwater interface of previous test pit excavations. To evaluate any potential for the recovery of bulk phase petroleum hydrocarbons, a 4" PVC observation well was installed at this test pit receptor.

As excavations were continued in a westerly direction away from TP M 25.0, the limits of older filling were defined by the variation in the density, age and type of fill materials encountered. Test borings S-19 and S-20 were placed in close proximity to test pit excavations M 25.0 through M 28.0 to evaluate in situ groundwater quality and further define the nature of soil conditions in this portion of the project site. Soil conditions encountered during the placement of test boring S-19 were consistent with those observed during the nearby test pit excavations consisting of sand and gravel fill, atop cinders and miscellaneous fill material to a depth of approximately 15.5 feet. Noticeably different soils were encountered during the placement of test boring S-20, where fill material consisting of sand and gravel and trash extended to approximately 9.5 feet, at which depth a native peat layer was encountered. This peat layer extended to approximately 13 feet, and was followed by stratified lenses of fine to coarse sands, blending into clay at approximately 16 feet. The presence of this clay layer is consistent with the lower soil conditions encountered as a general type across major portions of the study area.

In general, the fill material encountered in the northeastern portions of DPW property at borings S-14 through S-18 consisted predominantly of fine to medium sands and gravel, with indications of brick and concrete with an average depth of 10 - 13 feet from surface grade. The stratum of fill materials was typically underlain by fine to medium sands and organic silts at each boring location. Visual inspection of soil conditions during the placement of test borings S-14 through S-20 revealed a characteristic black staining accompanied by olfactory indications of coal tar contaminants at the soil/groundwater interface. The presence of coal tar factions, particularly noticeable in samples taken from the 10 - 12 foot depth interval at S-15 and S-18 and subsequently quantified using OVA analysis.

To determine any horizontal migration of the petroleum residuals detected during the placement of test pit excavations at M 25.0 - M 28.0, two additional excavations (M 35.0 and M 36.0) were placed along the northern foundation wall of the DPW building, as shown on the overlay to Figure 5. Underlying soil/sediment conditions were consistent with those observed during previous excavations in this area, comprised of asphalt and sandy fill atop slag, brick, wood, municipal trash. Of principle note was the absence of any indications to suggest the presence of significant concentrations of petroleum hydrocarbons, either by olfactory or visual inspection of the exposed soils. Furthermore, while excavations were penetrated to a depth of approximately 8.5 feet, no infiltration of groundwater was noted. This further supports the presence of localized groundwater accumulations as a function of in situ geology, particularly in the area of M TP 25.0 where groundwater levels were encountered at depths of approximately 6 feet or less. Site activities associated with the former dredge spoil basin are a probable influence upon the conditions noted.

To define the nature of in situ fill material in the vicinity of the former streambed, delineated on Figure 5, test borings S-14 through S-18 were performed. In the initial site assessment reference was made to a possible streambed passing through the northeast corner of the DPW property, which would account for some of the fill material encountered during the excavation of test pits 25.0 through 27.0. Information compiled by TRC is presented as Figure 6 and is referenced from a 1904 Sanborne Fire Insurance map. Further review of site history information, however, suggests that the watercourse as delineated may have actually been a variation in the superposition of the U-shaped streambed which passed primarily through the Lombard property. As shown on the overlay to Figure 6, superposition of the 1987 Edgeworth Tannery facilities over the present site configuration indicates that the streambed passed through the northeast corners of the DPW property in close proximity to the edge of TP W 25.0, however, passing primarily through the Lombard parcel. The evolution of filling operations is discussed in detail in Section

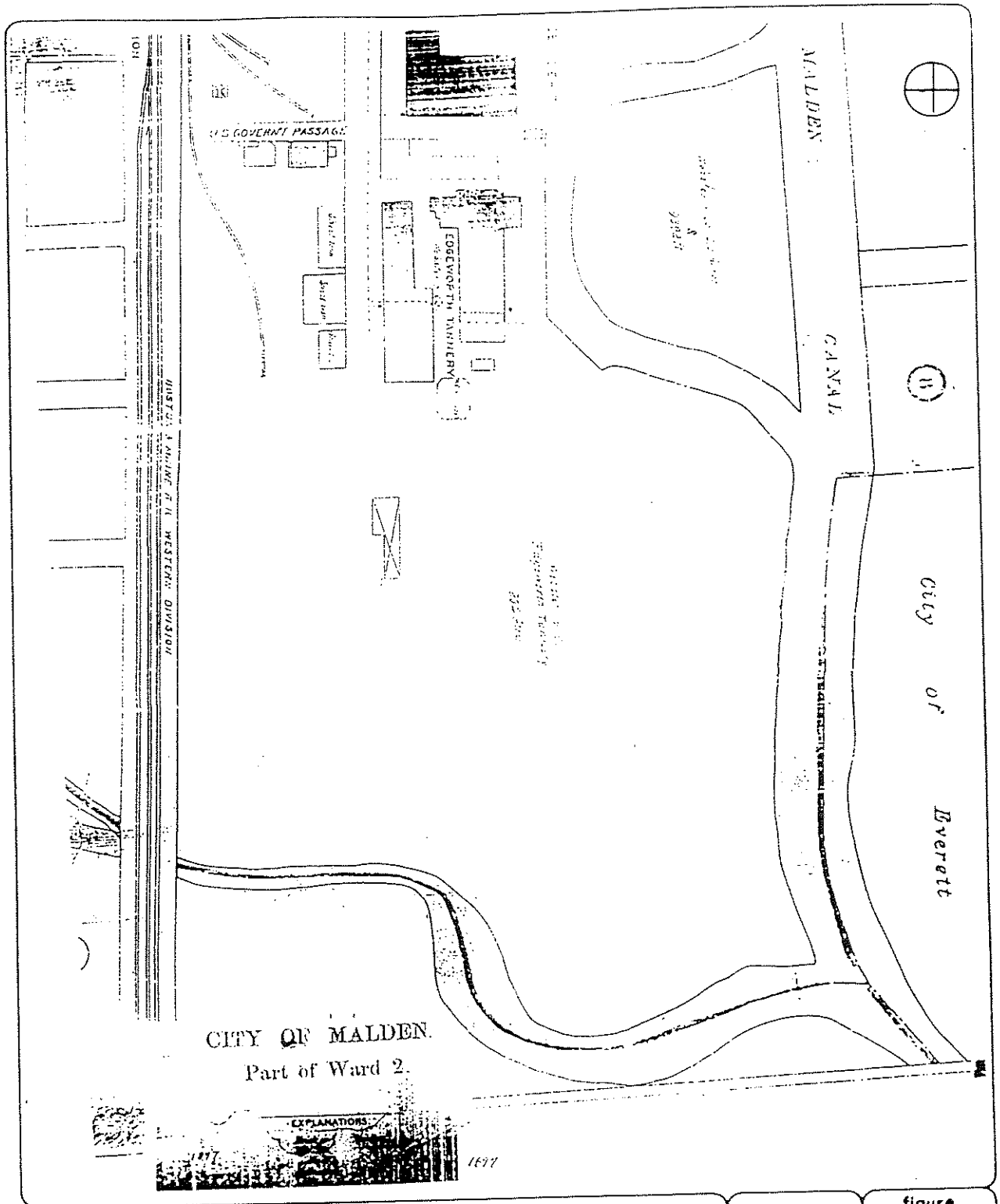


figure 6 A

date

job no.

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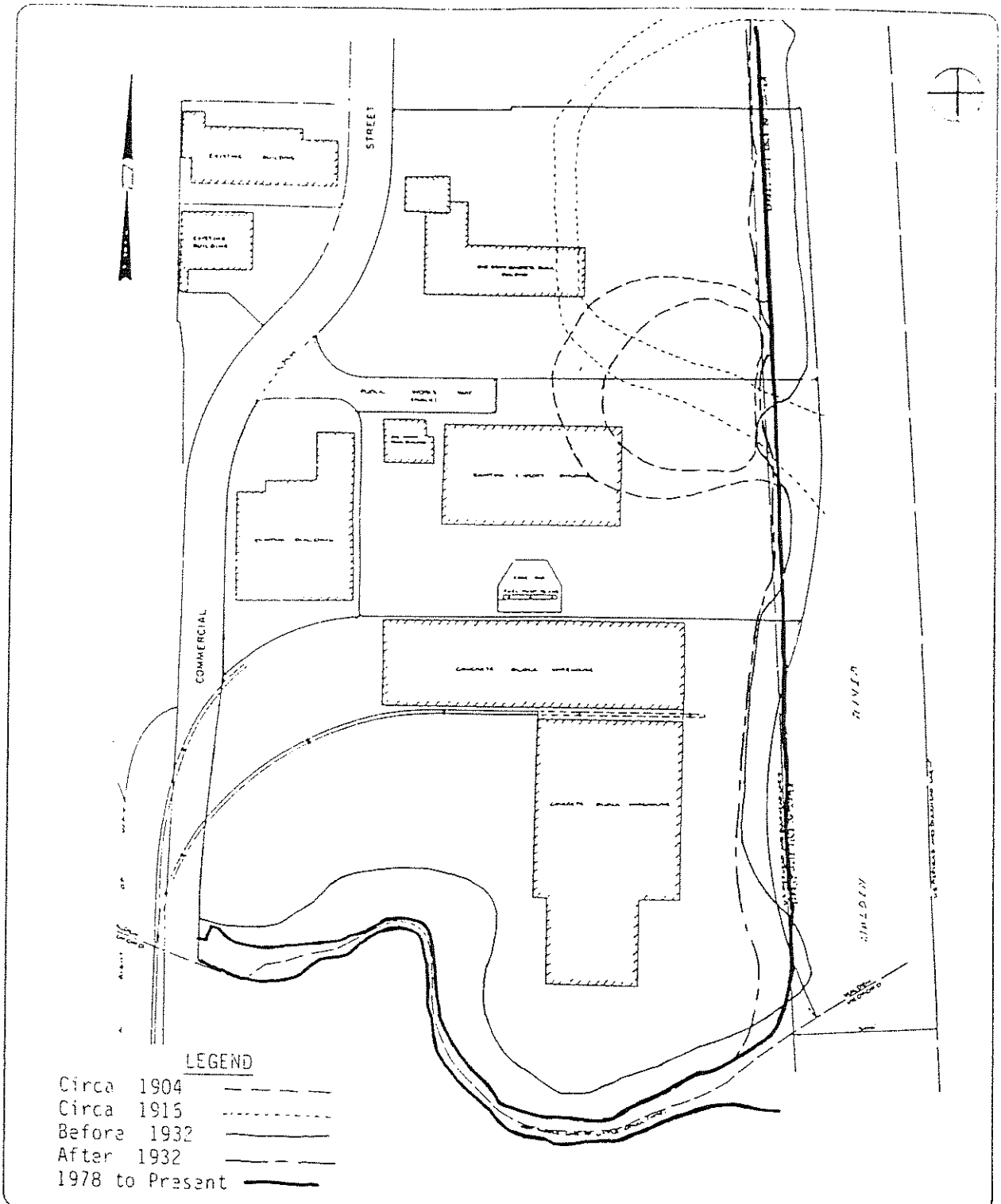

MALDEN RIVER COURSES

REFERENCE TRC FIGURE 2-5

figure **6**

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date MAY 1988

job no. 0065-02

5.0 of this report. However, given the age of the materials encountered in TP 25.0, i.e., 1938, it appears that the fill material encountered at the Lombard/MDPW property line postdates filling operations associated with the streambed.

A second objective of site investigatory actions performed at the Malden DPW site was a delineation of possible coal tar accumulations in the vicinity of test pit receptor M-8, which was placed by TRC during the initial site assessment. To evaluate in situ soil conditions in this portion of the site, test pit excavations M 29.0 through M 31.0 were placed along the southern perimeter of the site, in the approximate locations shown on Figure 5. Soil conditions encountered during these test pit excavations consisted primarily of sandy gravel fill, slag and miscellaneous debris to depths of approximately 4.0 - 5.0 feet, where a native red peat layer was encountered. Groundwater infiltration was noted at each test pit excavation atop native peat layer and indications of coal tar contamination were evidenced by the naphthalene/camphor odor and a slight sheening of groundwater infiltration. No recoverable quantities of bulk coal tar fractions were observed during test pit excavations performed in this portion of the site.

Similar subsurface conditions were noted during the placement of test pit excavations M 32.0 and M 33.0 in areas immediately to the northeast of the previously described test pit excavations. At each of these locations, sand and gravel fill containing slag, brick and miscellaneous metal pieces was encountered atop the peat, with a slight sheening of exposed groundwater accumulations due to coal tar fractions noted. Soil conditions encountered during the placement of TP M 34.0 consisted of one foot of sandy gravel fill beneath asphalt atop fill containing building debris comprised of concrete, brick and metal scraps. Between 3.1 and 3.8 feet, a more uniform fill preceded the native peat layer. Higher indications of residual coal tar contamination were encountered during the placement of this test pit amidst the gravel layer with vertical migration inhibited by the underlying peat.

Following the visual inspection of in situ soil conditions in representative soil samples were taken and screened for volatile organic compounds as possible indicators of hazardous materials or oils. Sampling protocol and analytical techniques utilized in the field assessment of in situ soil conditions are discussed in detail in the environmental site assessment reports referenced in Section 1.0. In situ screening was performed with a Tip II photoionization meter and delineation of the various volatile fractions contributing to total VOC concentrations detected was performed utilizing a Century 128 Organic Vapor Analyzer. Gas chromatography procedures utilized in the OVA analysis incorporated the use of a methane standard, together

with headspace analytical techniques. The results obtained reflect concentrations in air, released or volatized, into the headspace over the sample volume. The resultant chromatograms for each applicable sample are recorded on a continuous strip chart.

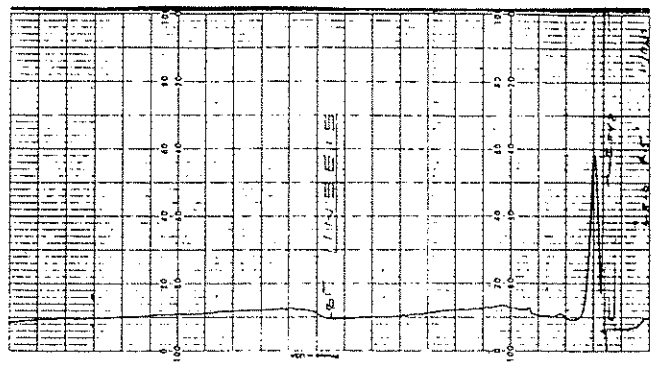
As indicated above, a methane standard is utilized in the gas chromatography procedures associated with the OVA analysis, as such, total VOC concentrations summarized in Tables 2.1, 2.2 and 2.4 reflect synthetic as well as naturally occurring volatile organic compounds. This potential is represented graphically in Figure 7, which illustrates the representative GC chromatograms associated with the analysis performed on soil samples from the 2.5, 5.0 and 6.5 foot depths in TP M 26.0. As shown, total VOC concentrations of 48 ppm were detected at the 2.5 foot sample, due predominantly to the presence of naturally occurring organic activity or methanogenesis, in contrast to total VOC concentrations of 62 ppm detected in the 6.5 foot split which revealed the presence of a weathered petroleum hydrocarbon. Similar results were detected in the overlying soil compartment at 5'.

At TP M 25.0 and TP M 27.0 indications of weathered petroleum fractions were detected in the shallow soil compartment, as indicated in Figure 8, however, with significant variations in the total VOC concentrations due to methanogenesis or biodegradation of organic matter, particularly at TP M 25.0. Of principle note were the low levels of volatile petroleum fractions within groundwater samples taken from TP M 25.0 and TP M 26.0, Figure 9, in comparison to the overlying source potential and disturbance of steady state conditions in the area. In addition, at M 28.0, only trace indications of residual petroleum fractions were noted.

Visual inspection of in situ soil conditions during the placement of test borings S-14 through S-20 suggests the presence of coal tar contaminants at the soil/groundwater interface in the 10 - 12 foot depth interval at S-15 and S-18. VOC screening of the applicable soil samples from this depth revealed enhanced indications of biochemical activity due to the degradation of organic matter, as indicated in Figure 10.

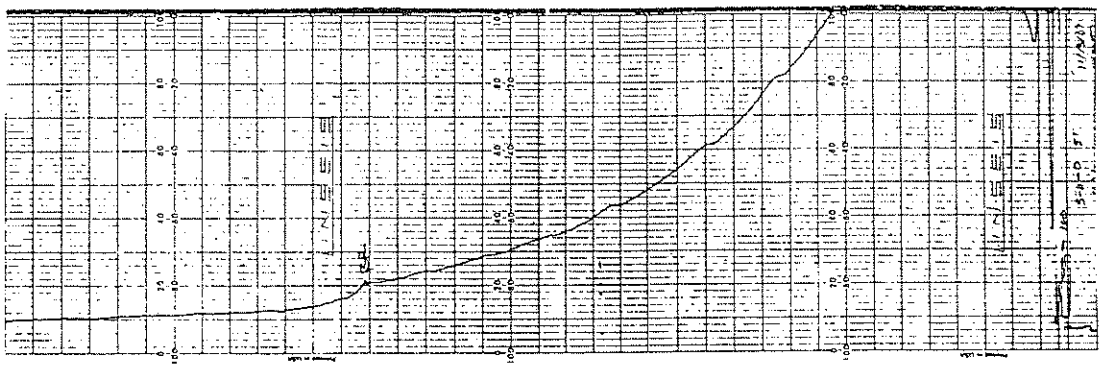
TEST PIT EXCAVATION TP-26 SOIL SAMPLE @ 2.5'

[VOC] = 48 ppm
11/13/87



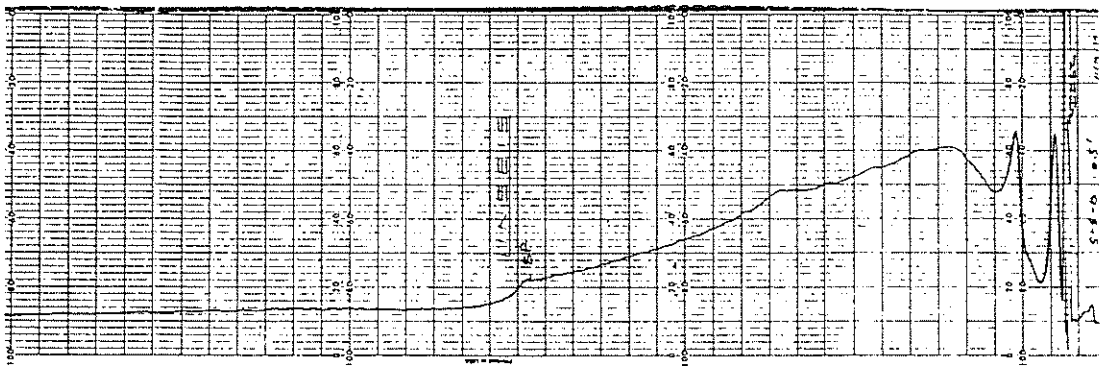
TEST PIT EXCAVATION TP-26 SOIL SAMPLE @ 5.0'

[VOC] = 180 ppm
11/13/87



TEST PIT EXCAVATION TP-26 SOIL SAMPLE @ 6.5'

[VOC] = 62 ppm
11/13/87



TOTAL HEADSPACE CONCENTATIONS OF VOLATILE ORGANIC COMPOUNDS (ppm)

figure **7**

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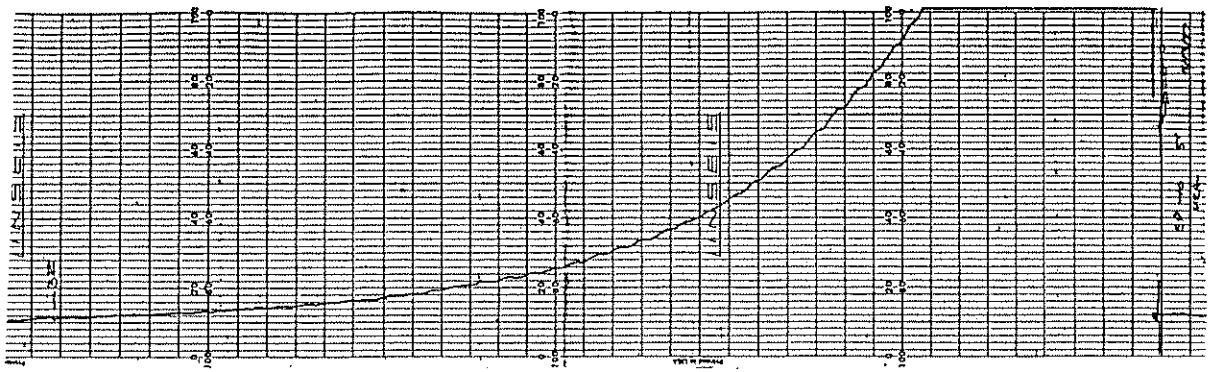
job no. 0065-02

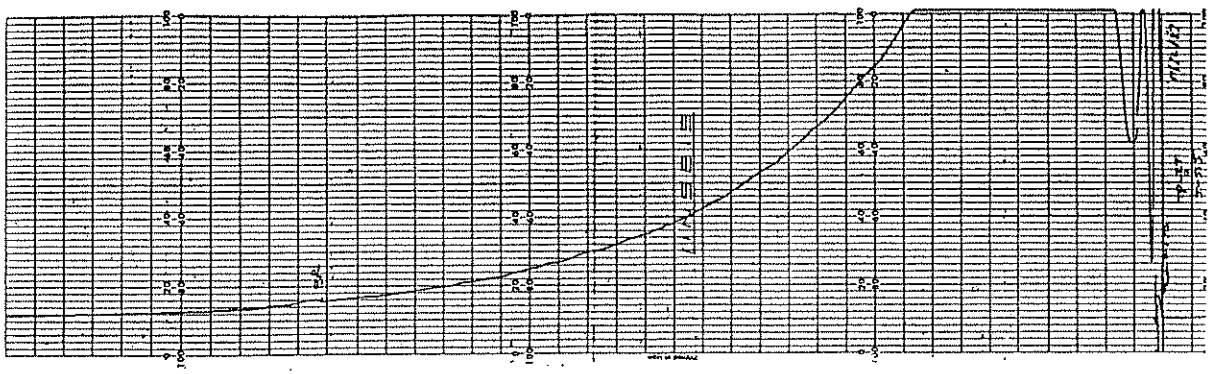
TEST PIT EXCAVATION M-25 0-10' COMPOSITE @ 5' SOIL SAMPLE

[VOC] = 640 ppm
11/13/88



TEST PIT EXCAVATION M-27 @ 5 - 5.5' SOIL SAMPLE

[VOC] = 340 ppm
11/16/88



TOTAL HEADSPACE CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS (ppm)

figure **8**

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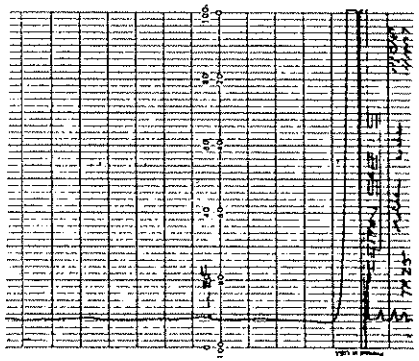
job no. 0065-02

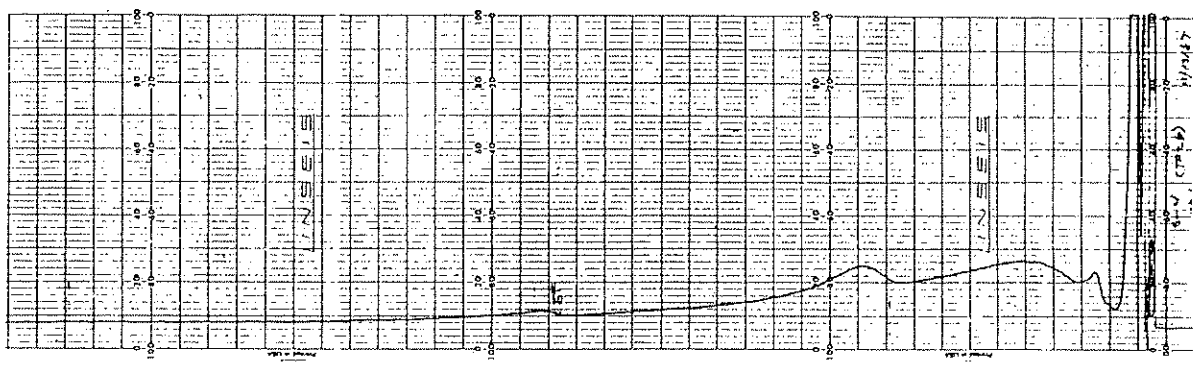
MLDN

000596

TEST PIT EXCAVATION M-25 GROUNDWATER SAMPLE
[VOC] = 170 ppm
11/13/87



TEST PIT EXCAVATION M-26 GROUNDWATER SAMPLE
[VOC] = 120 ppm
11/13/87



TOTAL HEADSPACE CONCENTATIONS OF VOLATILE ORGANIC COMPOUNDS (ppm)

figure **9**

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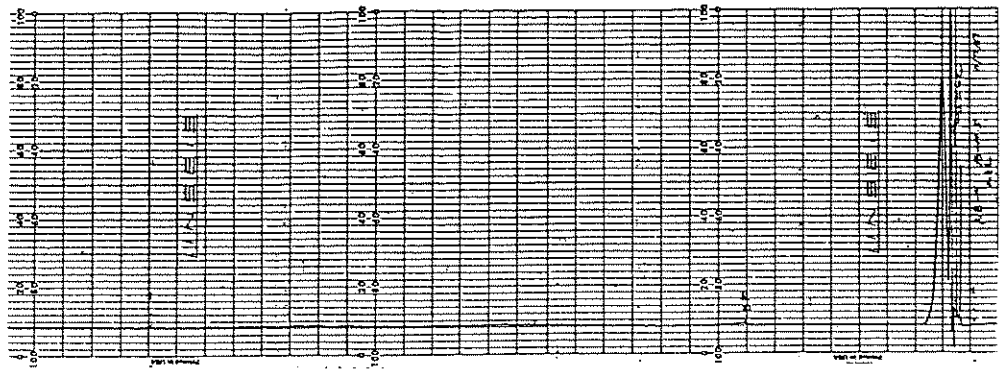
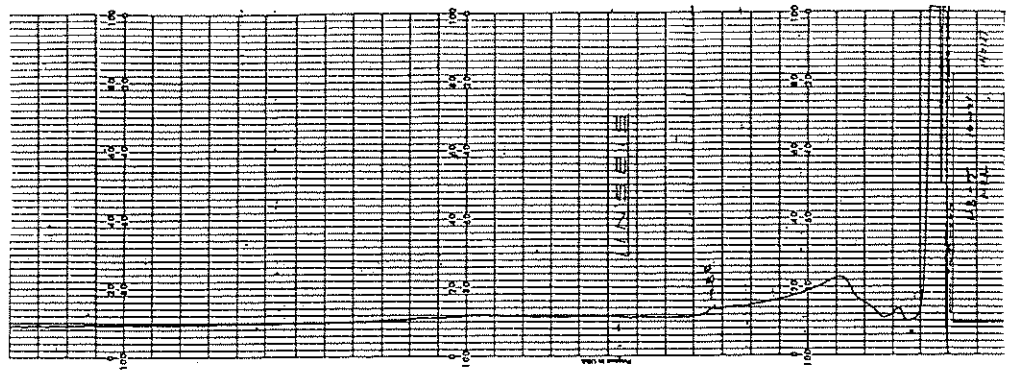
MLDN

000597

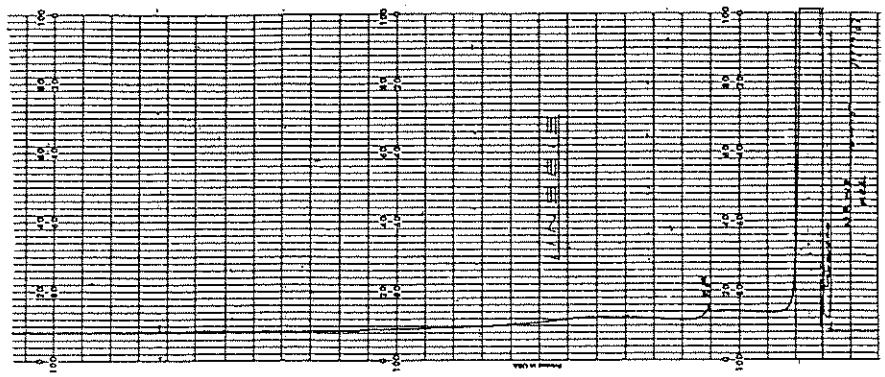
TEST BORING S-14 SOIL SAMPLE @ 10 - 10.5'
[VOC] = 110 ppm
11/17/87



TEST BORING S-15 SOIL SAMPLE @ 10 - 12'
[VOC] = 1000 ppm
11/17/87



TEST BORING S-18 SOIL SAMPLE @ 10 - 11.5
[VOC] = 1000 ppm
11/17/87



TOTAL HEADSPACE CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS (ppm)

figure **10**

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date MAY 1988

job no. 0065-02

Table 2.1 Total Concentrations of Volatile Organic Compounds*

Sample Description: Soil

13 November 1987

DPW Yard

Test Pit Excavations

Sampling Location	Depth	VOCs, ppm* Concentrations
M 25.0 (Trench**) in an easterly direction - 1'	2.5'	14
6'	2.5'	20
12'	2.5'	32
18'	2.5'	30
24'	2.5'	24
24' - 30'	2.5' Composite	6.8
0' - 10'	5.0' Composite	640
10' - 18'	5.0' Composite	105
18' - 24'	5.0' Composite	300
24' - 30'	5.0' Composite	20
M 26.0	2.5'	48
	5.0'	180
	6.5'	62
	16 November 1987	
M 27.0	2.0' - 2.5'	51
	5.0' - 5.5'	340
M 28.0	2.0' - 2.5'	16
	5.0' - 5.5'	70
	5.5' - 7.5'	1.2

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

**TP M 25.0 is a trench cut excavation commencing at TRC test pit M-13 and extending in an easterly direction towards TRC test pit M-12.

Table 2.1 Total Concentrations of Volatile Organic Compounds* (Continued)

17 November 1987

DPW Yard

Sampling Location	Depth	VOCs, ppm* Concentrations
M 29.0	0.0' - 2.0'	ND
	2.0' - 3.0'	ND
	3.0' - 4.0'	18
	(A) 4.0'	7.2
	(B) 4.0'	7.5
M 30.0	0.0' - 1.5'	0.1
	5.0' - 5.5'	10.0+
M 31.0	0.0' - 2.0'	ND
	2.0' - 4.0'	1.8
	4.0' - 4.5'	4.0
M 32.0	0.0' - 5.0'	0.2
	5.0'	0.3
M 33.0	0.0' - 1.5'	ND
	1.5' - 4.0'	2.0
	4.0' - 5.0'	0.1
M 34.0	1.5'	0.1
	3.5'	62
	4.5' - 5.0'	0.7
M 35.0	1.0' - 1.5'	0.2
	5.0' - 7.0'	0.3
	8.0'	38
M 36.0	1.0' - 2.0'	0.2'
	8.0' - 8.5'	50

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 2.2 Total Concentrations of Volatile Organic Compounds*

Sample Description: Soil

17 November 1987

DPW Yard

Soil Test Borings

Sampling Location	Depth	VOCs, ppm* Concentrations
S-14	0.0' - 3.0'	0.6
	5.0' - 6.5'	0.1
	10.0' - 10.5'	110
	10.5' - 11.5'	1.2
	15.0' - 16.5'	2.1
S-15	0.0' - 2.0'	ND
	5.0' - 6.5'	2.4
	8.0' - 8.5'	1.2
	10.0' - 12.0'	1000
	12.0' - 14.0'	4.2
	15.0' - 17.0'	6.2
**S-16	0.0' - 2.0'	ND
**S-17	0.0' - 2.0'	1.2
	5.0' - 7.0'	4.0
S-18	0.0' - 2.0'	3.2
	5.0' - 7.0'	1.6
	10.0' - 11.5'	1000
	15.0' - 17.0'	60

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

** S-16 and S-17 were placed in close proximity to a French Drain structure constructed of large concrete blocks/boulders and other construction debris, to evaluate the nature of shallow overlying fill material and drain configuration.

Table 2.2 Total Concentrations of Volatile Organic Compounds* (Continued)

17 November 1987

DPW Yard

Sampling Location	Depth	VOCs, ppm* Concentrations
S-19	0.0' - 3.0'	9.0
	5.0' - 7.0'	62
	10.0' - 12.0'	180
	15.0' - 16.5'	20
S-20	0.0' - 3.0'	ND
	5.0' - 7.0'	78
	10.0' - 12.0'	0.2
	15.0' - 16.5'	ND
	16.5' - 17.0'	ND
S-21	0.0' - 3.0'	ND
	5.0' - 7.0'	62
	10.0' - 12.0'	ND
	15.0' - 16.5'	ND

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 2.3 Field Analysis for Groundwater Quality Characteristics

November 1987

DPW Yard

Sampling Location	Temperature (°C)	Conductivity (@25°C)	Salinity	Depth to Groundwater
M 25.0				
End	14.0	258	0	7.0'
12'East	16.8	722	0	8.6'
24'East	14.8	353	0	8.6'
M 26.0	15.6	340	0	6.8'
MW-1	11.9	3002	1.6	6.6'
S-9	15.1	875	0.1	4.7'
S-14	-	-	-	6.6'
S-18	-	-	-	6.4'
S-19	-	-	-	6.5'
S-20	-	-	-	6.8'
S-21	-	-	-	6.4'
		18 May 1988		
S-14	10.0	2892	1.5	6.6'
S-18	9.0	1436	0.5	6.4'
S-19	11.5	1197	0	6.4'
S-20	11.5	433	0	6.8'
S-21	11.0	321	0	6.4'

Table 2.4 Total Concentrations of Volatile Organic Compounds

Sample Description: Groundwater

20 November 1987

DPW Yard

Sampling Location	VOCs, ppm* Concentrations
M 25.0	
End	1000
12' East	280
24' East	290
M 26.0	92
MW-1	1.0
S-9	1.0
S-14	1000
S-18	1000
S-19	1000
S-20	1000
S-21	500

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 2.5 Field Test Results - Water Samples
Screening for pH

DPW Yard

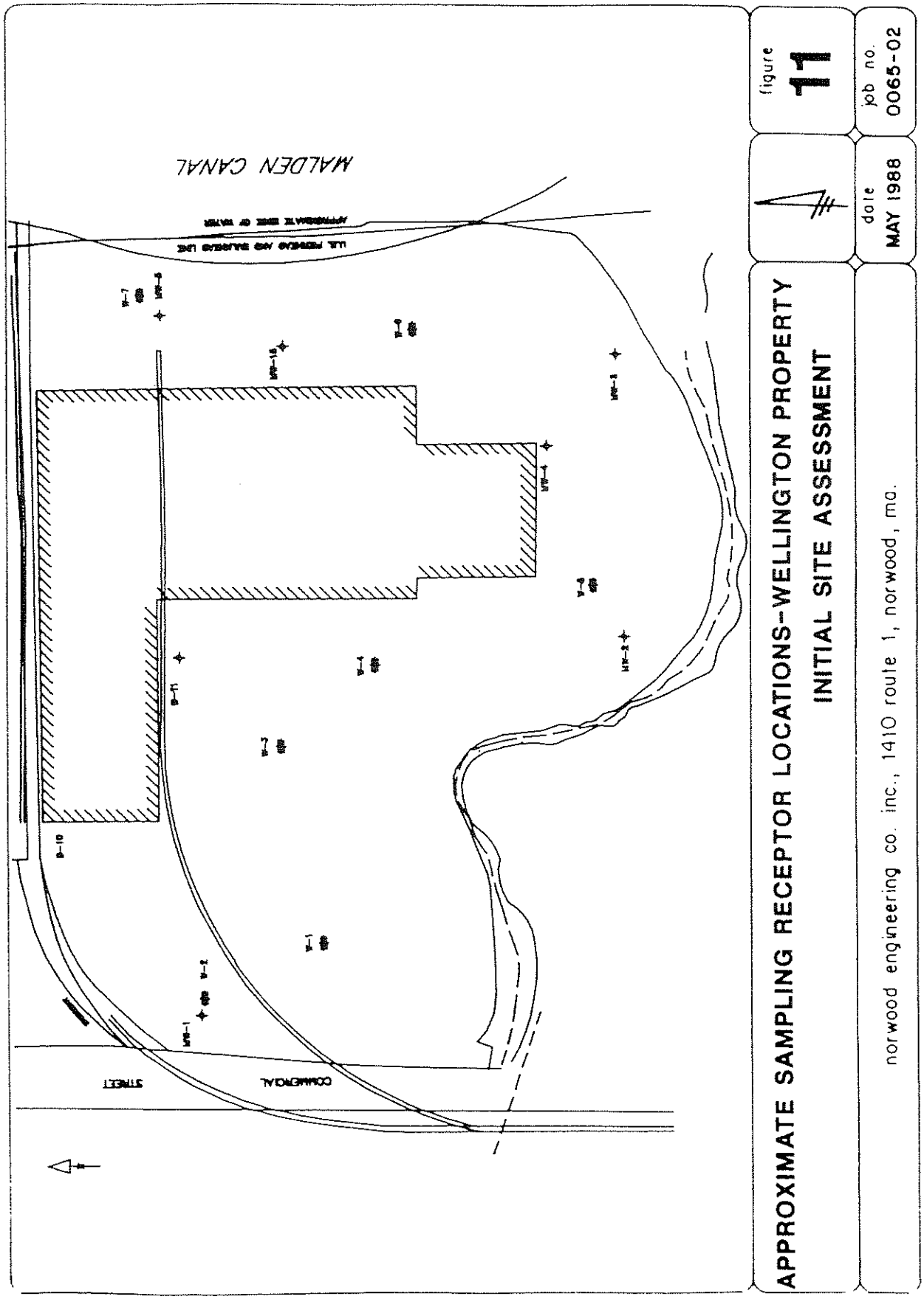
Location	pH
1 December 1987	
MW-1	7.95
S-9	7.4
S-14	6.8
S-18	7.0
S-19	6.9
S-20	7.0
S-21	7.1

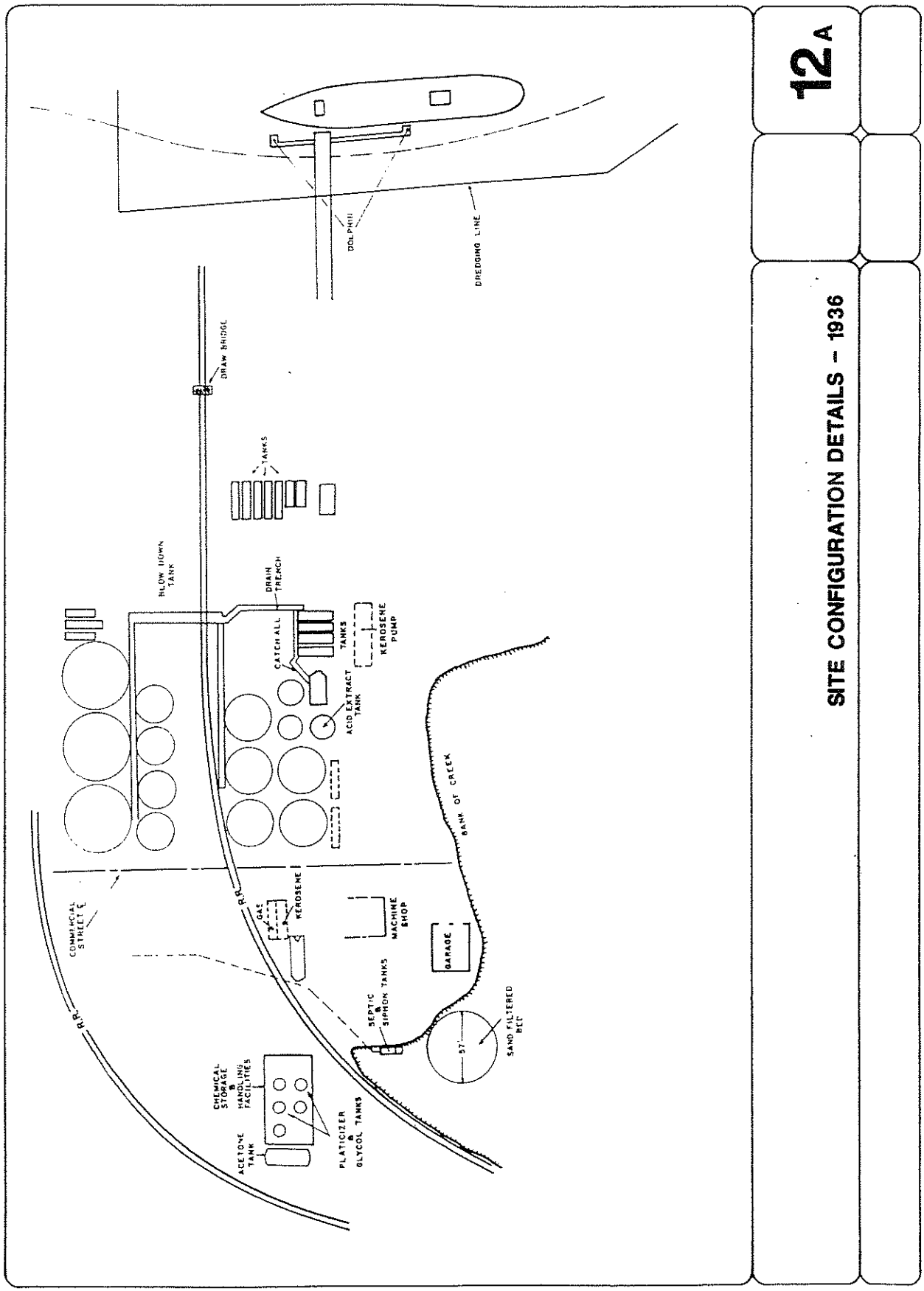
3.0 Field Investigations - Wellington Parcel

A sketch plan of the Wellington parcel and approximate sampling locations placed during the initial assessment may be referenced from Figure 11. Following completion of the initial phase of environmental studies upon the Wellington parcel, new site history information was provided by site owners which revealed characteristics pertaining to site configuration at the time of coal tar operations associated with the Barrett Division of Allied Chemical Company. This information included a copy of a 1936 Plat Plan, revised in February of 1937, which depicted the principle elements of the coal tar plant in existence at that time. A detail sketch of significant site features and reproduction of the 1936 Plat Plan may be referenced from Figure 12. As shown, there were numerous locations where above and below ground storage of petroleum and coal tar products existed at the time of coal tar processes. Prior to the implementation of field activities associated with the interim work plan, a review of this site history information was performed, with modifications to the scope of work made accordingly.

Principle objectives addressed during investigatory site actions upon the Wellington property included the evaluation of former petroleum and coal tar storage areas, drainage systems within the process operations area and characterization of previously existing marshlands/surface waters, which were subsequently filled to accommodate present site configuration. Additional aspects of the scope of work implemented during this phase of study are outlined in the Work Plan, a copy of which is enclosed as Appendix B.

Review of previous field and laboratory data compiled by TRC suggested the presence of free phase coal tar in the vicinity of test boring B-11 and W 4.0, in excess of background conditions found over the more general study area. To evaluate the feasibility of interim remedial measures in these areas, site activities were initiated with the placement of test pit Wellington (W) 8.0 in the approximate location shown in Figures 13 and 14. As shown on the overlay of previous site configuration, Test pit W 8.0 was placed in an area of former kerosene storage. Soil conditions encountered at this location consisted of sandy gravel fill beneath asphalt cover, extending to a depth of approximately 4 feet where the presence of leather scraps, cloth and felt were observed atop native peat. Further excavations into the peat layer revealed the presence of fine sands and silts blending into a dense marine clay. Groundwater recovery at this location was limited to a seepage at the transition zone between the gravel fill and leather scraps. The depth to groundwater seepage also approximated the lower limits of a thin band of coal tar sediments, which were observed within the gravel fill.


MALDEN CANAL
COMMERCIAL STREET
figure 11
job no. 0065-02
date MAY 1988
APPROXIMATE SAMPLING RECEPTOR LOCATIONS-WELLINGTON PROPERTY
INITIAL SITE ASSESSMENT
norwood engineering co. inc., 1410 route 1, norwood, ma.


12A
SITE CONFIGURATION DETAILS – 1936
DOLPHIN
DREDGING LINE
DRAW BRIDGE
TANKS
BLOW DOWN TANK
DRAIN TRENCH
CATCH ALL
TANKS
KEROSENE PUMP
ACID EXTRACT TANK
BANK OF CREEK
R.R.
COMMERCIAL STREET
GAS
KEROSENE
MACHINE SHOP
GARAGE
SEPTIC & SIPHON TANKS
SAND FILTERED BED
57
CHEMICAL STORAGE & HANDLING FACILITIES
ACETONE TANK
PLASTICIZER & GLYCOL TANKS

BARRETT CHEMICAL DIVISION
PLAT PLAN IN MALDEN , MASS.
FEBRUARY 25, 1937

figure **12**

date MAY 1988

job no. 0065-02

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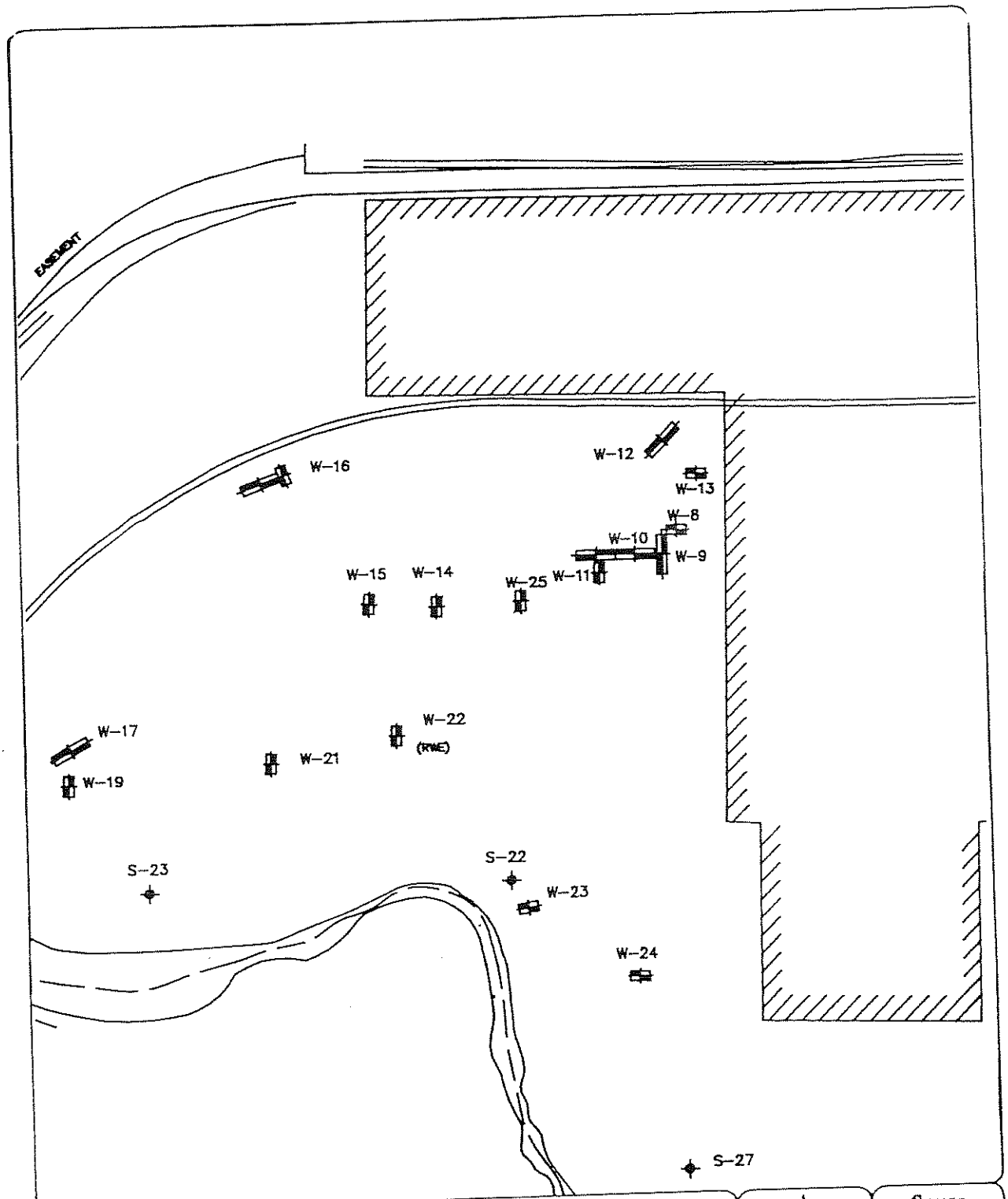


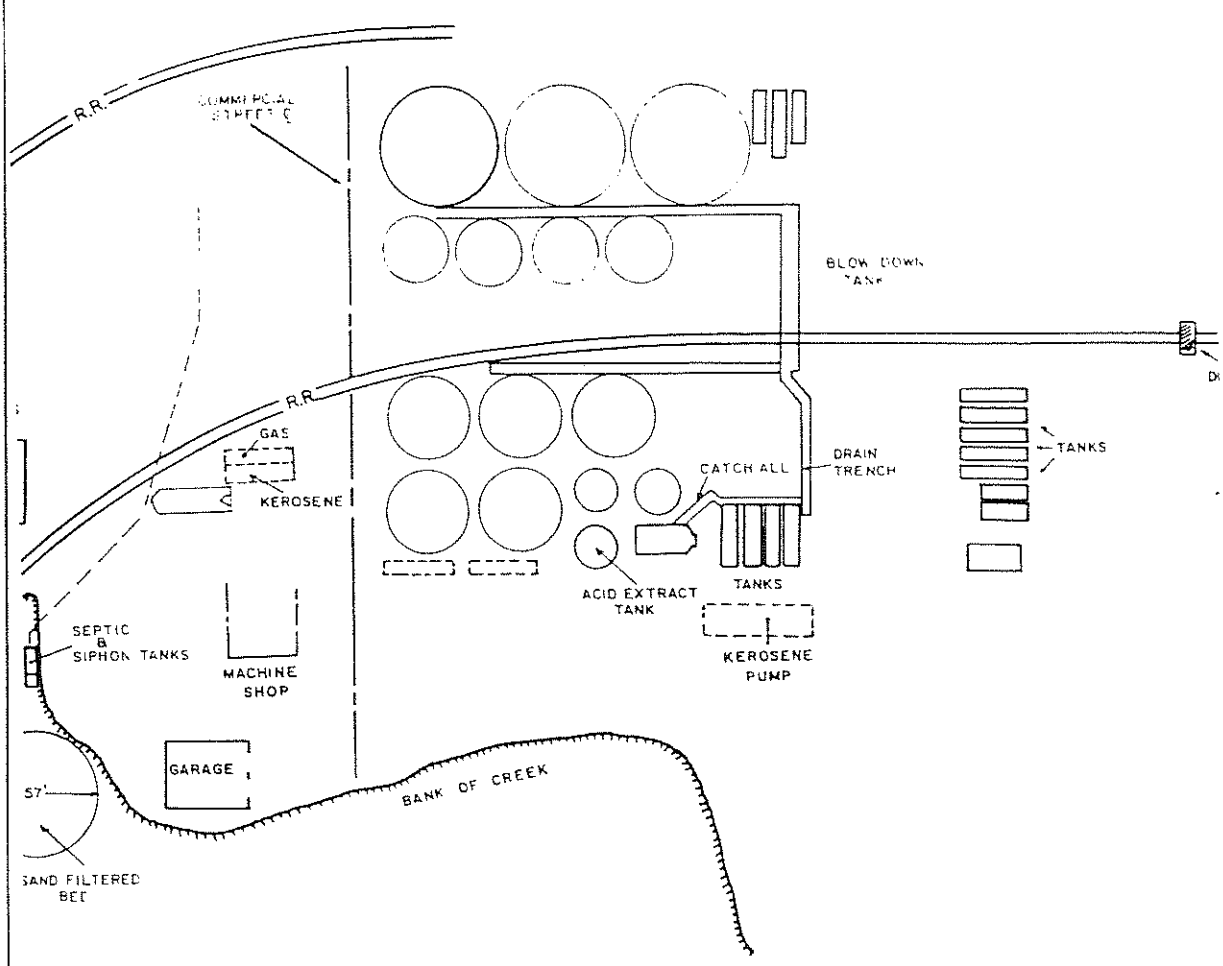
INTERIM DATA STUDY 12/87 • WELLINGTON PROPERTY

norwood engineering co. inc., 1410 route 1, norwood, ma.

figure 13A

date MAY 1988

job no. 0065-02

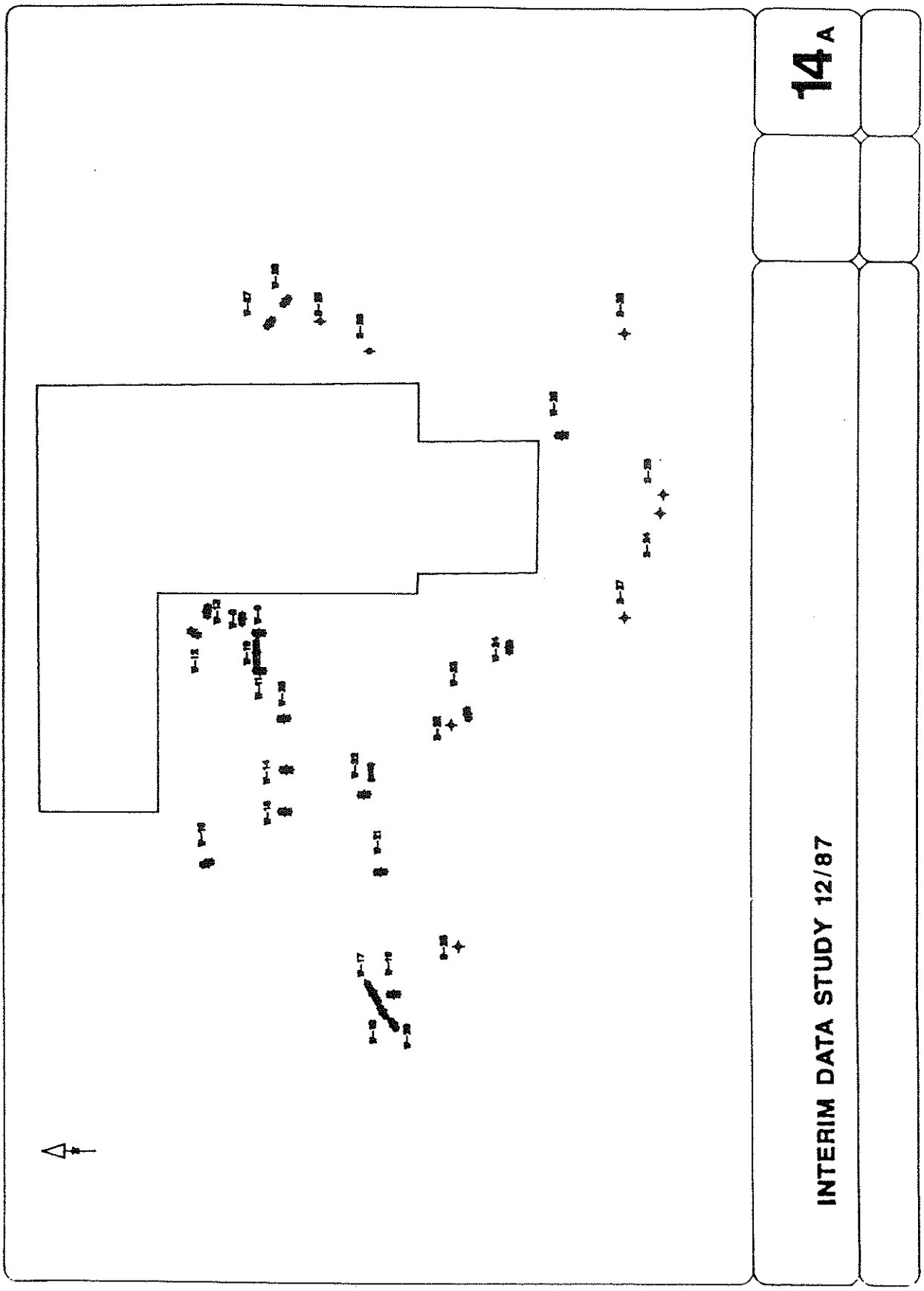


BARRETT CHEMICAL DIVISION PLAT PLAN DETAIL

figure **13**

date

job no.


14A
INTERIM DATA STUDY 12/87

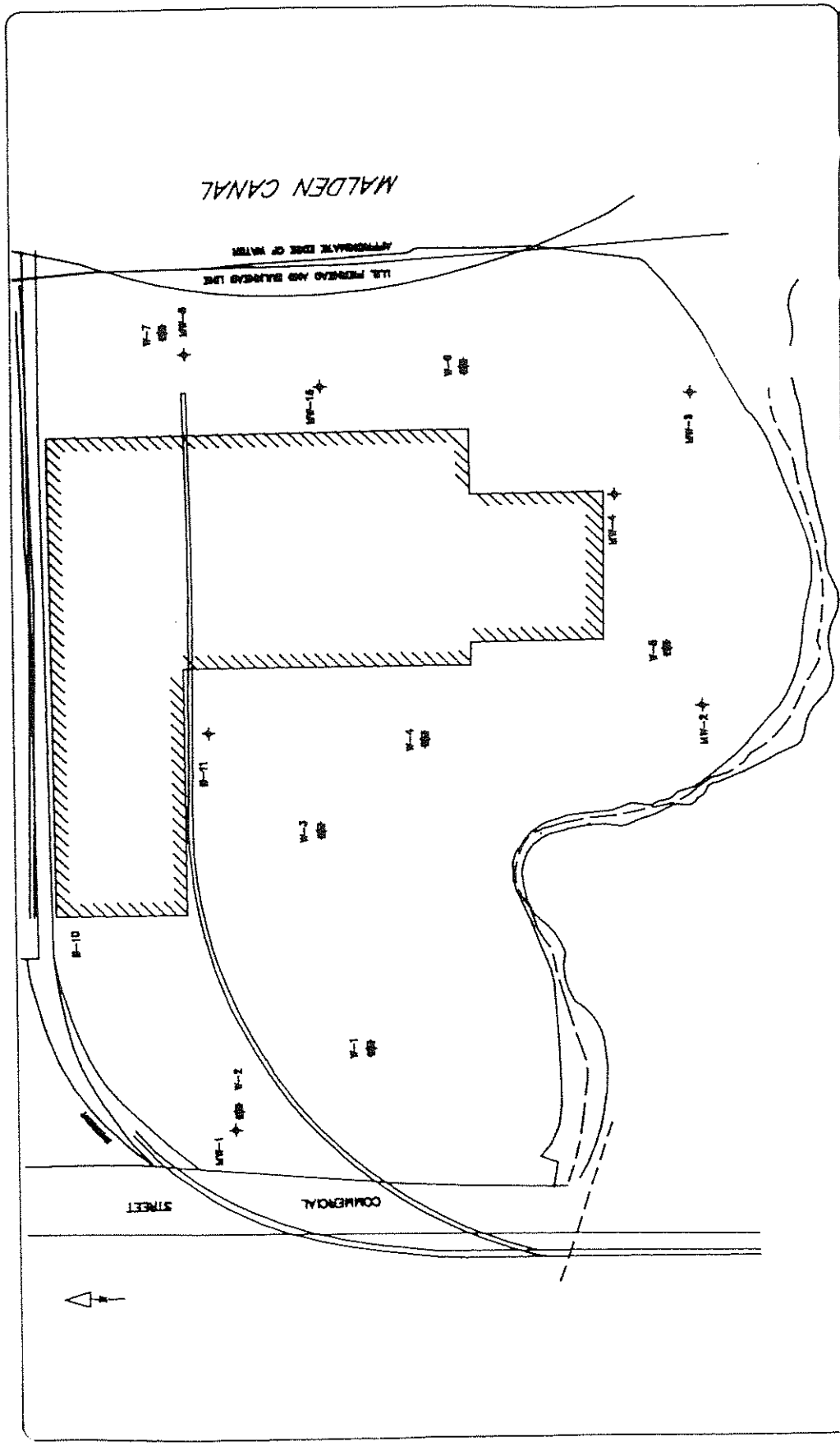


figure 14

job no. 0065-02

date MAY 1988

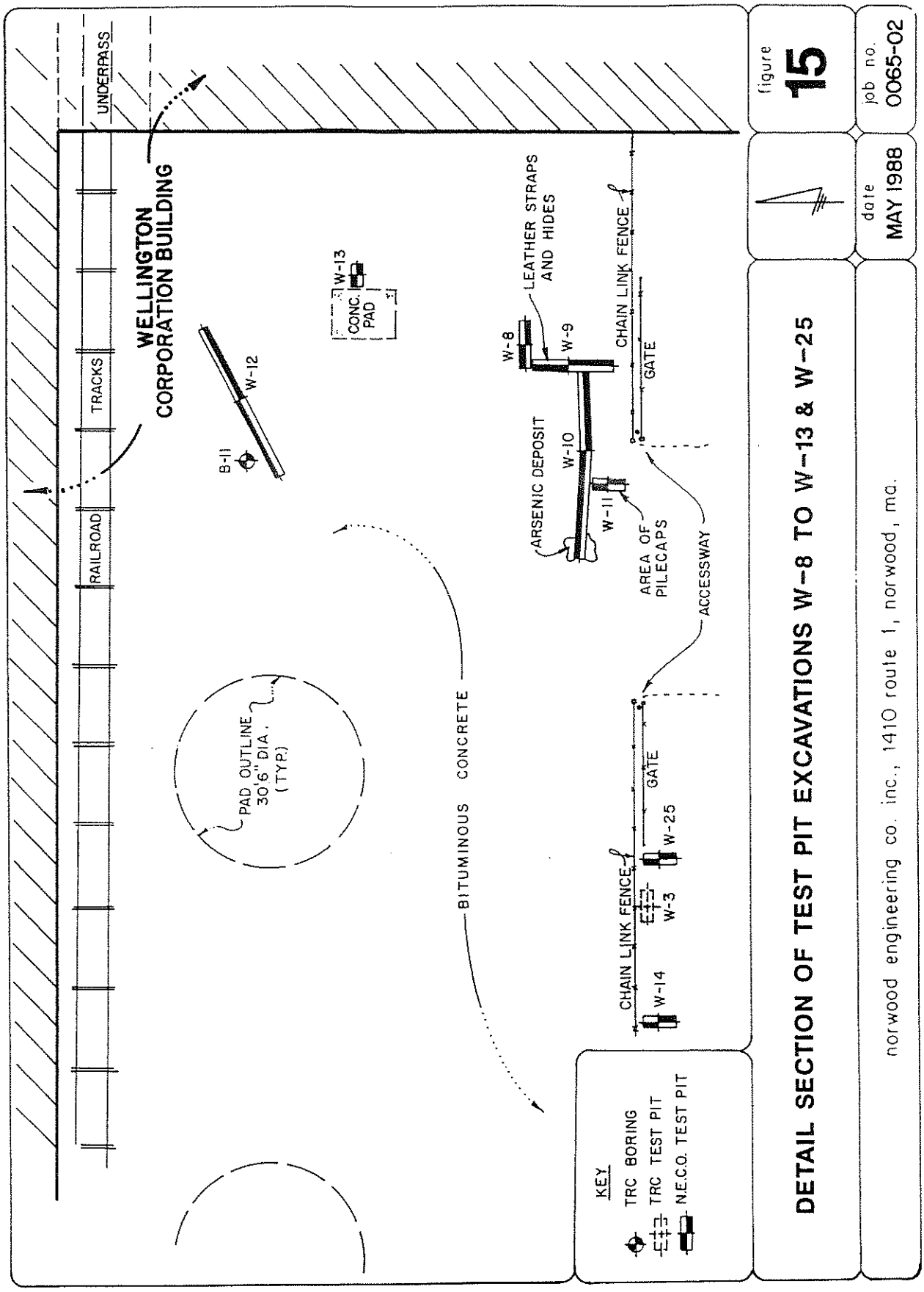
APPROXIMATE SAMPLING RECEPTOR LOCATIONS-WELLINGTON PROPERTY
INITIAL SITE ASSESSMENT

norwood engineering co. inc., 1410 route 1, norwood, ma.

Test pit W 9.0 was extended from the western edge of W 8.0 in a southerly direction through the underground storage area for a distance of approximately 20 feet. Soil conditions encountered during this excavation were consistent with those observed within TP W 8.0, consisting of a miscellaneous fill atop sandy gravel to a depth of 4.8 feet where leather scraps preceded the peat layer. The presence of reed grass in the peat transition zone to the underlying clay layer suggests the presence of a former estuary or marsh in this portion of the site. As observed previously, groundwater recovery in this test pit excavation was limited to minor seepage at the transitional layer between the gravel and underlying leather/peat, with no recoverable quantities of coal tar fractions noted.

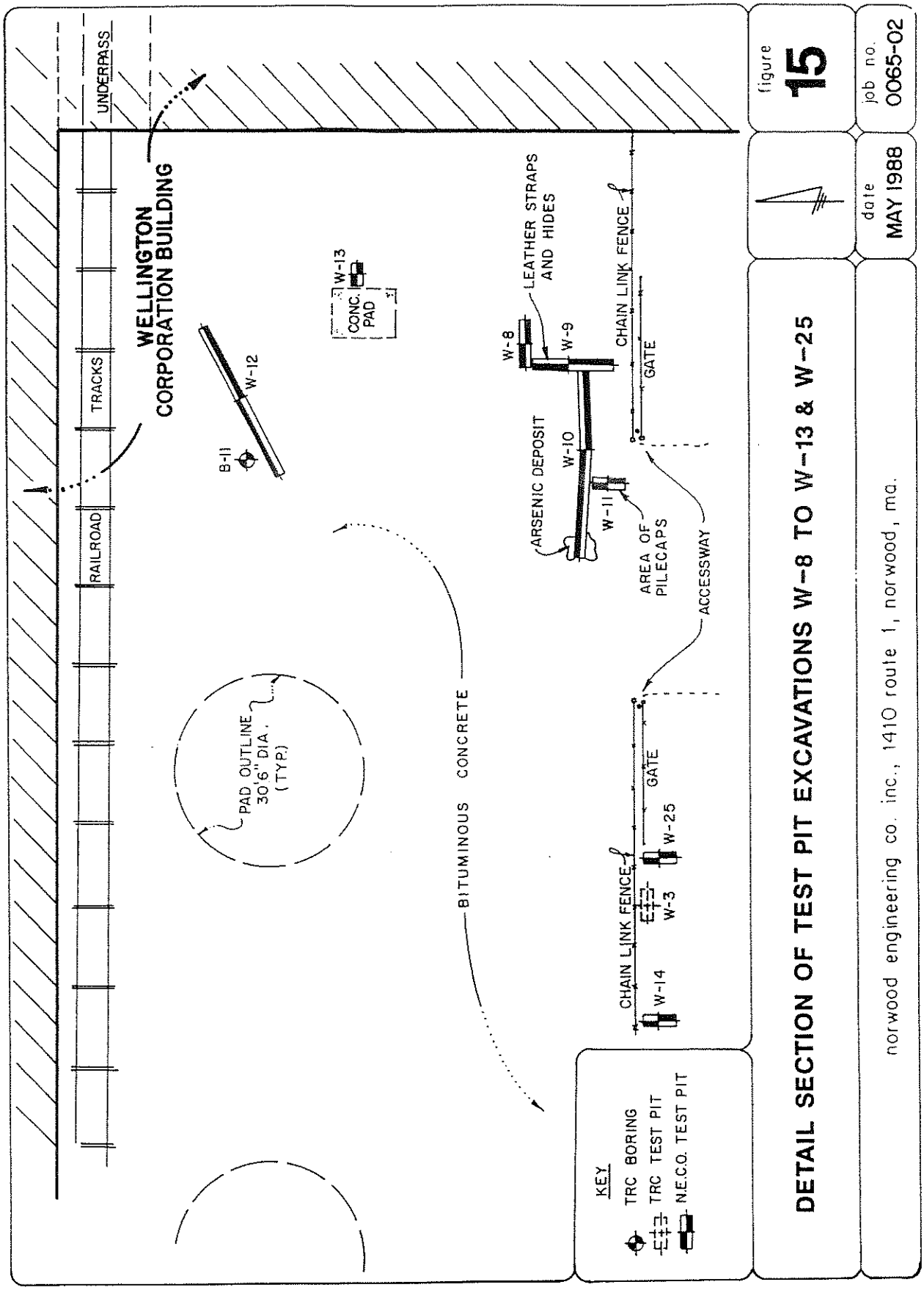
As indicated on Figure 14 and on the detail section presented as Figure 15, TP W 10.0 was placed at the midpoint of W 9.0 and extended in a westerly direction for approximately 40 feet. As before, shallow soil conditions consisted of approximately 4.5 feet of gravel fill containing indications of coal tar contamination at the seepage or infiltration point of shallow groundwater, which also denoted the transition between gravel and the underlying leather scraps. Of principle note, however, was higher quantity of hides, wooden barrel slats and leather in the 4.5 to 6.5 foot depth interval. This 2 foot layer of fill material was followed by the typical dry peat formation and marine clays. In addition, at the western end of this test pit excavation a 10 - 12 inch wide lens of chalky white material of similar material to that identified as arsenic during the Phase I study was detected. This lens extended over a distance of approximately 4 feet, at which point the excavation was terminated to accommodate access to rear portions of the site.

Additional observations noted during the excavation of TP W 10.0 included the presence of 2 inch distribution piping and several electrical conduits in the shallow fill material reflective of previous land use characteristics. In each of the test pit excavations, groundwater recovery was observed in the form of a seepage suggesting that the vertical migration potential of coal tar constituents is severely inhibited by the presence of the underlying native peat and marine clays. Furthermore, variations in the amount of groundwater recovery suggests that recharge due to precipitation, water lines and/or drainage utilities are likely to be contributory sources to movement within the shallow aquifer. As such, it is probable to assume that future site activities inclusive of the permanent remediation alternative will significantly reduce the amount of shallow groundwater/surface water movement, thus, increasing the immobility of the constituents of concern.


UNDERPASS
WELLINGTON CORPORATION BUILDING
TRACKS
RAILROAD
B-11
W-12
CONC. PAD
W-13
W-8
LEATHER STRAPS AND HIDES
W-9
CHAIN LINK FENCE
GATE
ARSENIC DEPOSIT
W-10
W-11
AREA OF PILECAPS
ACCESSWAY
PAD OUTLINE 30'6" DIA. (TYP.)
BITUMINOUS CONCRETE
CHAIN LINK FENCE
W-14
W-3
W-25
GATE
KEY
TRC BORING
TRC TEST PIT
N.E.C.O. TEST PIT
DETAIL SECTION OF TEST PIT EXCAVATIONS W-8 TO W-13 & W-25
figure 15
date MAY 1988
job no. 0065-02
norwood engineering co. inc., 1410 route 1, norwood, ma.

MLDN

000615


UNDERPASS
WELLINGTON CORPORATION BUILDING
TRACKS
RAILROAD
B-11
W-12
CONC. PAD
W-13
W-8
W-9
LEATHER STRAPS AND HIDES
CHAIN LINK FENCE
GATE
ARSENIC DEPOSIT
W-10
W-11
AREA OF PILECAPS
ACCESSWAY
PAD OUTLINE 30'6" DIA. (TYP.)
BITUMINOUS CONCRETE
CHAIN LINK FENCE
W-14
W-3
W-25
GATE
KEY
TRC BORING
TRC TEST PIT
N.E.C.O. TEST PIT
DETAIL SECTION OF TEST PIT EXCAVATIONS W-8 TO W-13 & W-25
figure 15
date MAY 1988
job no. 0065-02
norwood engineering co. inc., 1410 route 1, norwood, ma.

Field inspection of the project site in the area of test pit W 10.0 revealed numerous indications of circular rises in localized topography, suggesting the presence of buried piles. To investigate this condition, test pit W 11.0 was extended for a distance of approximately 12 feet in a southerly direction from TP W 10.0. Exposure of subsurface conditions confirmed the presence of wood piles in this portion of the site associated with previous land use operations. In addition, the typical coal tar stained gravel layer and organic fill material consisting of leather scraps and hides were noted over the limits of the excavation.

Test pits W 12.0 and W 13.0 were placed in the northern portions of the Wellington property to investigate reported coal tars observed by TRC during the placement of test boring B-11 and excavations in the area of the nearby loading bay. Review of site history information presented on the 1936 Barrett Plan revealed the presence of a trench network for process operations in this portion of the site, suggesting that the reported accumulations of coal tars may be directly related to formerly existing structures. Soil conditions encountered during the placement of TP W 12.0 included approximately 6.0 feet of sandy fill comprised of fine to coarse sands with a trace of gravel. At the northeast corner of this test pit excavation, a localized pocket of heavy coal tar accumulation was noted at a depth coincidental with groundwater seepage (1.5' - 3.0'). Sheening of infiltrated groundwater and characteristic coal tar odors were observed, however, no recoverable bulk fractions noted. Furthermore, sands and gravel encountered at this location were underlain by dry, brown, marine peat blending into the graded silts and clay, consistent with regional soil stratigraphy.

TP W 13.0 was placed at approximately 30 feet to the south of test pit W 12.0 and extended in a westerly direction, as shown on Figure 15. As indicated within the soil logs, presented as Appendix B, two layers of bituminous concrete were encountered during this excavation at surface grade and approximately 1.0 foot below, with a layer of red peastone gravel in between. Immediately below the second asphalt layer, black, heavily stained, sandy fill material exhibiting a higher accumulation of coal tars were observed. Physical characteristics in this portion of the site, i.e., sloping surface grades in the form of a depression, and the presence of overlying asphalt layers appeared to induce a higher accumulation of both shallow groundwater and coal tars. These conditions resulted in the rapid influx of perched waters during the initial penetration of the soil compartment. Below this shallow depth, the density of the native marine deposits, i.e., peat and clay, together with the seepage of groundwater at the transition zone between the fill and the peat represent a limited potential for vertical migration of coal tar constituents. Regrading of surface cover during future site activities will significantly improve or mitigate the potential for the accumulation of water volumes noted.

To further investigate the deposition of arsenic materials upon the project site between TP W 3.0 and W 10.0, test pit excavations W 14.0 and W 15.0 were placed in the approximate locations shown on Figure 14. Test pit W 14.0 was excavated to a depth of 12 feet and encountered various layers of sandy gravel fill, as well as three different layers of bituminous concrete within the 0 - 3 foot depth interval. Below the third asphalt layer, miscellaneous brick rubble and construction debris extended to approximately 6 feet where a native layer of reed grass, organic peat and silts were encountered. Visual inspection of the organic layer revealed more tidal or wetland characteristics, i.e., substantial amounts of reed grass, prompting a continuation of this excavation. At approximately 11.5 feet, a graded bed of fine to medium sands was penetrated, suggesting the presence of a flow zone associated with earlier site history. No arsenic bearing materials were observed within the exposed soil profile suggesting the presence of a limited deposit between test pit W 10.0 and W 3.0. Shallow test pit W 15.0 was placed to the west of TP W 3.0 and W 14.0 at the southwest corner of the former above ground coal tar storage area (Figure 14) and in close proximity to the easterly edge of former Commercial Street Extension. Soil conditions observed in the shallow soil profile consisted of multiple layers of gravel fill and bituminous concrete over organic sediments, with no indications of arsenic bearing materials and of the characteristic coal tar seepage generally observed within the gravel fill layer.

Test pit W 16.0 was placed in an area where indications of the storage of gasoline and kerosene were delineated on the Barrett Chemical Plan. Soil conditions encountered in this investigation were consistent with typical fill layers observed across the project site, comprised of fine to medium sands and gravel, bricks and miscellaneous scrap metal. In addition, 2 inch distribution piping was also present, alluding to the former underground storage that existed in this portion of the site, however, no additional indications of underground storage were noted.

One of the principle objectives of the Interim Work Plan was an investigation of soil and groundwater quality in the vicinity of the former leaching or sand filter bed, revealed during a review of site history records. To evaluate conditions in this portion of the project site test pits W 17.0 through W 20.0 were excavated in the approximate configuration delineated on Figure 14. For specific delineation of the types of fill material encountered during this test pit excavation reference to soil logs in Appendix D is recommended. In general, however, the fill material encountered was atypical with respect to remaining portions of the site. For example, during the excavation of test pit W 18.0, a significant amount of metal, copper wire, boulders, cast iron pipe, automobile seat, metal scraps, tires were encountered, suggesting that a substantial amount of filling had taken place to accommodate presently existing surface grades, as opposed to the more gradual progression of filling of tidelands.

The underlying stratum at test pits W 18.0 consisted of marsh grass and organic peat (6'±), which preceded the typical clay layer, with similar conditions were noted at depths of 8 and 9 feet at test pits W 17.0 and 19.0, respectively. Visual inspection of groundwater infiltration in this portion of the site which occurred at depths coincidental with the transition between the fill material and the denser native deposits revealed the presence of light oily odor and sheening suggestive of a #2 fuel oil with little indications of coal tars noted. These oily odors were most notable during the excavations of test pits W 18.0 and W 19.0.

The numerous indications of marine deposits and in particular stream bed material observed during the placement of test pit excavations upon the site warranted that additional investigations be performed to define potential flow zones along natural hydraulic boundaries. This behavior is believed to be related to detection of high concentrations of naphthalene by TRC during the analysis of soil conditions at TP W 4.0. To further characterize the coal tar migration characteristics and subsurface features in close proximity to Little Creek, test pit excavations W 21.0 - W 24.0 were excavated in the approximate locations shown on Figure 16. Reference to the overlays of 1916 and 1932, presented as Figure 17 indicates that these receptors approximate soil conditions within and at the limits of formerly existing creek path which passed through the location of the present Wellington facility and connected with the Malden River.

Indications of the probable stream banks were evidenced by southerly sloping deposits of sandy fill material encountered during the excavations of test pits W 21.0 and W 22.0. Furthermore, at approximately 2.5 feet from grade in test pit W 22.0, a layer of asphalt was encountered in the fill material. The bottom of the asphalt was solidified in a manner which suggested that it was poured while hot into an open body of water. At test pit W 21.0, groundwater recovery rates (5'±) were much more rapid in comparison to that observed in areas further to the north and exhibited characteristic coal tar sheening and naphthalene odor. Similar groundwater recovery characteristics were observed in the lower soils of W 22.0, with a more significant fraction of coal tars observed seeping in atop the native peat layer. To evaluate the recovery potential of coal tar fractions, a 3" PVC field observation well was installed at this location.

As indicated on Figure 16, test boring S-22 was placed in the notch or in close proximity to the northeasterly portion of Little Creek. Soil conditions encountered in this test boring consisted of approximately 10 feet of miscellaneous fill material with a very strong coal tar odor at approximately 1.5 feet from grade, followed by loose fine sands and silt and traces of peat over the length of the boring. During the recovery of split spoon samples, visual indications of heavy bulk phase coal tar

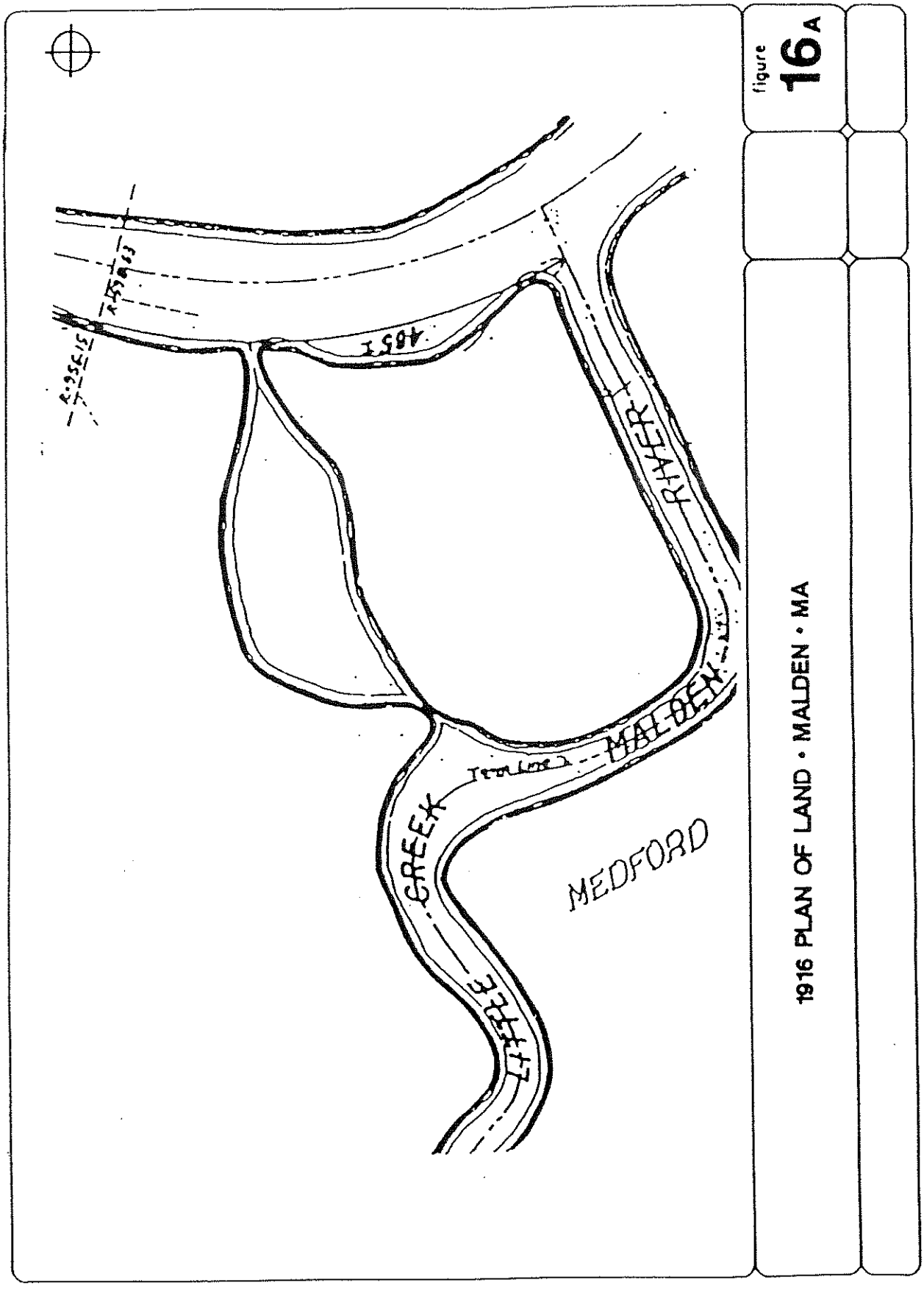


figure 16A
1916 PLAN OF LAND • MALDEN • MA
RIVER
MALDEN
CREEK
MEDFORD

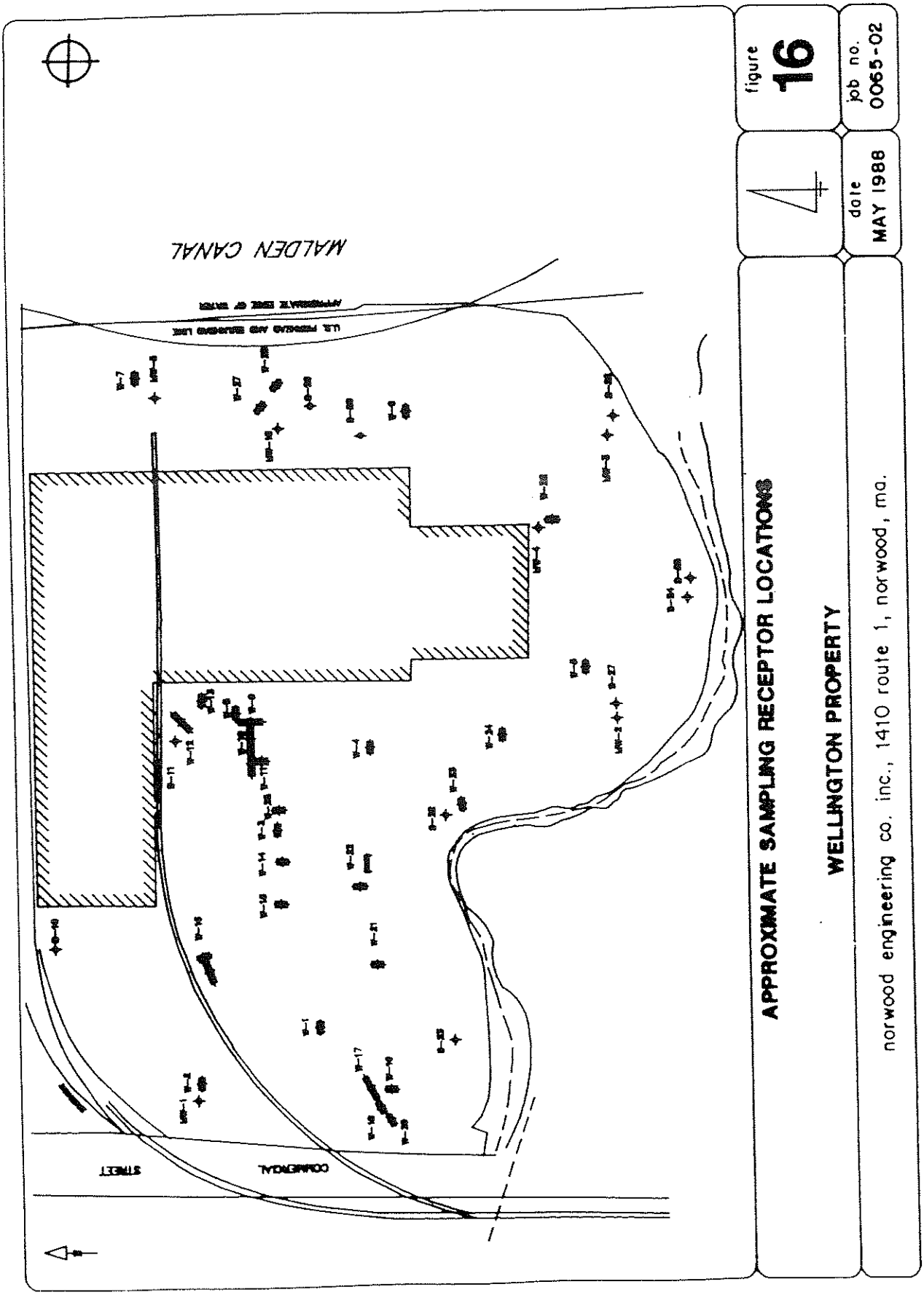


figure 16
job no. 0065-02
date MAY 1988
APPROXIMATE SAMPLING RECEPTOR LOCATIONS
WELLINGTON PROPERTY
norwood engineering co. inc., 1410 route 1, norwood, ma.
MALDEN CANAL
COMMERCIAL
STREET

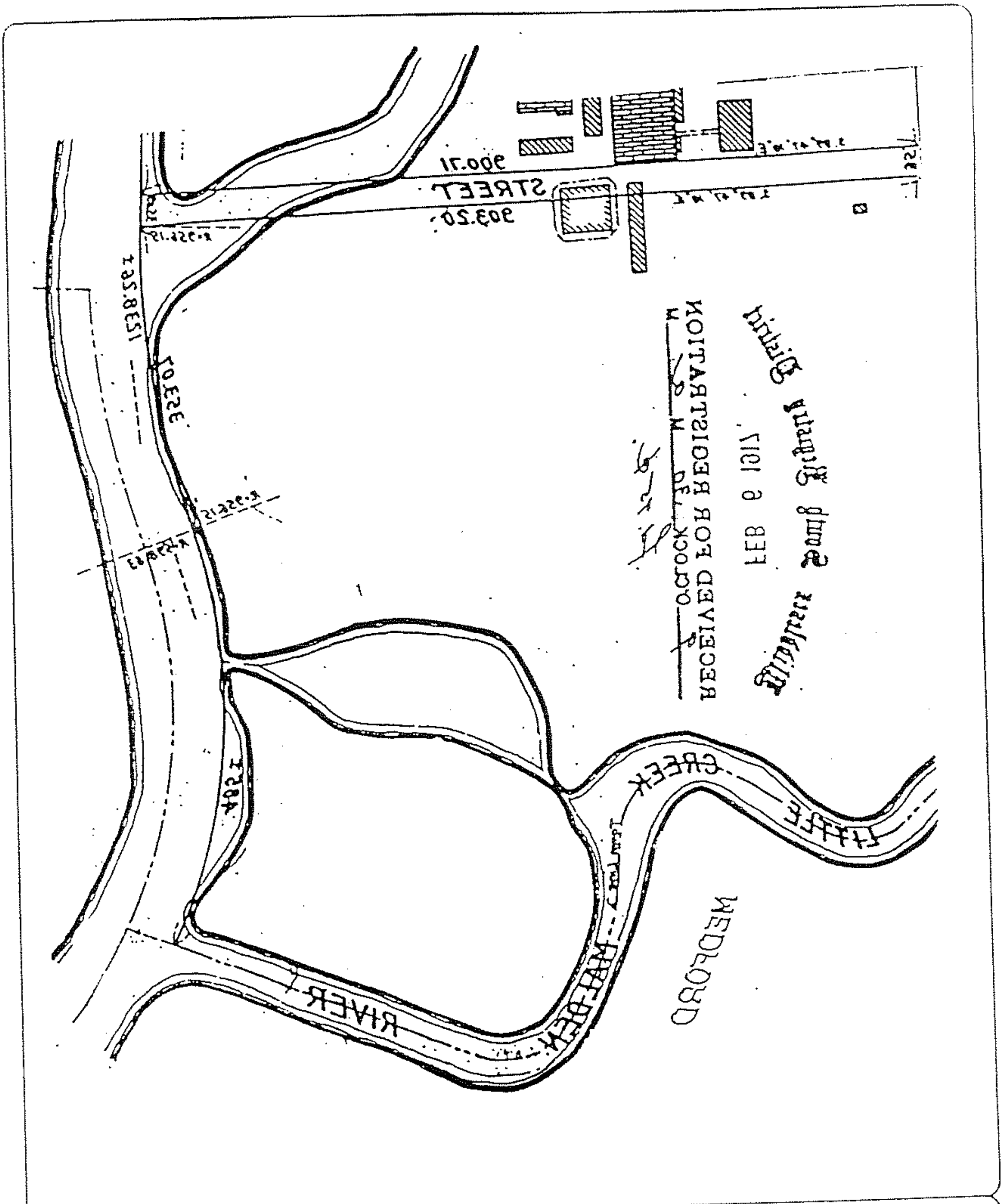


figure 17A

1916 OVERLAY

job no. 0065-02

date MAY 1988

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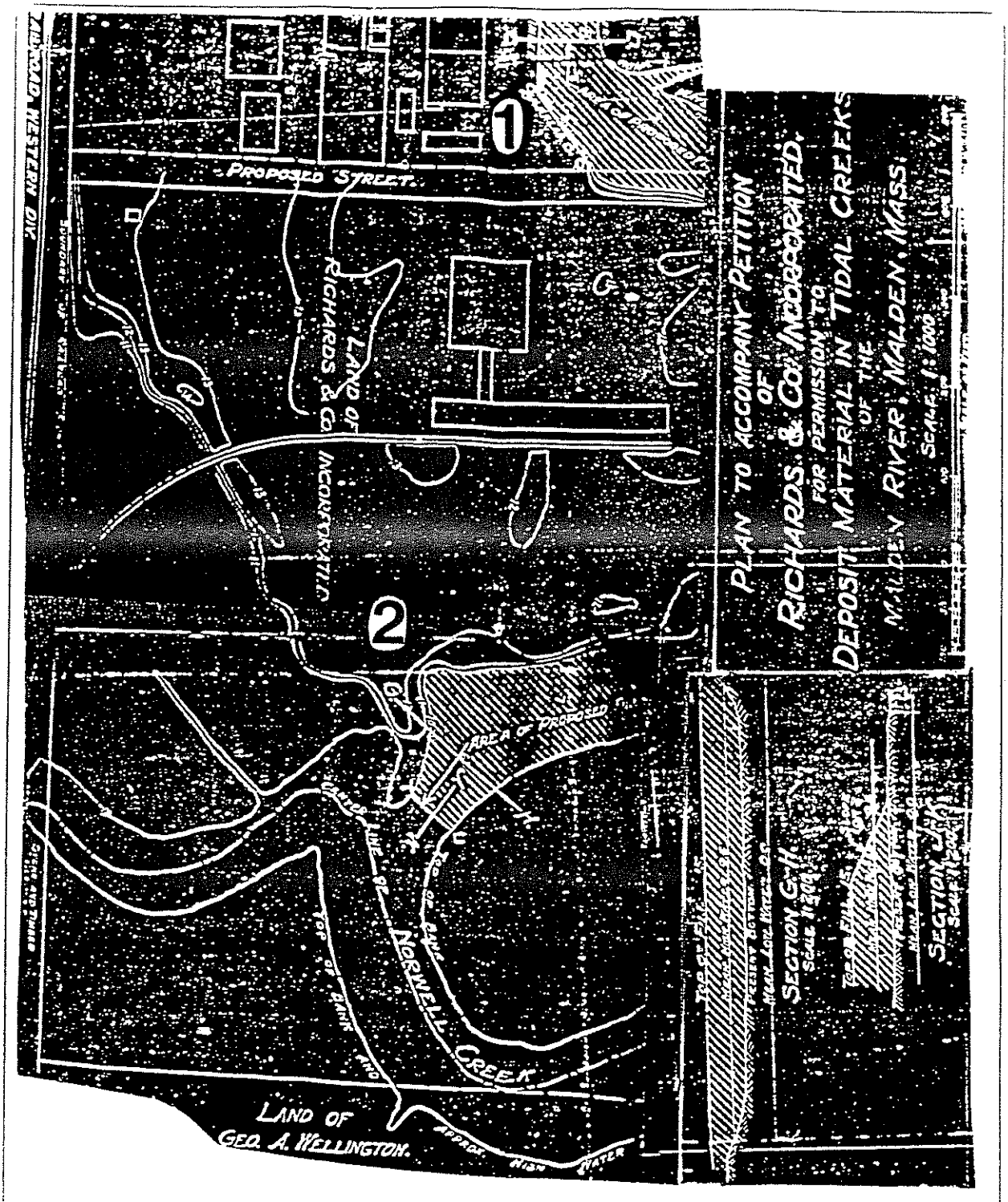


PROPOSED FILL LOCATIONS 1925

LOMBARD/M.D.P.W. (1) WELLINGTON/LITTLE CREEK (2)

figure 17

date MAY 1988

job no. 0065-02

fractions were observed. Test pit W 23.0 was placed in close proximity to test boring 22 to evaluate the nature of the fill material and heavy indications of coal contamination observed. A variable fill layer comprised of sands and gravel, ash and 3/4" rebar, concrete slabs and brick was observed to depths of approximately 9.0 feet, atop the native peat layer and amidst heavy accumulations of coal tar fractions.

Test pit W 24.0, which was placed approximately 30 feet to the south and 50 feet to the east of W 23.0, indicates the probable easterly limit of the former creek bed. Between 6.5 to 16.3 feet, intermittent layers of marsh grass, peat and sand deposits containing shells and significant silt fractions were observed, together with a rapid groundwater recovery rate at approximately 15.5 feet. Indications of coal tar contamination were noticeably less at this test pit location, however, fill material in the 0.3 to 6.5 foot depth range contained black tars and roofing materials.

Test pit W 25.0 was dug to the east of TP W 3.0 to further investigate the profile of arsenic deposition between TP W 10.0 and TP W 3.0, as well as the northerly limits of the former stream channel. In addition to the typical fill material comprised of gravel, brick, slag, sandy gravel, a wedge of white spongy material, tentatively identified as arsenic, was detected from 4.9 - 6.0 feet at the eastern end of this test pit. The arsenic deposit and surrounding material was underlain by native peat and marsh grass blending into the silty fine to medium sands and clay. The manner of arsenic deposition between TP W 10.0 and TP W 3.0 suggests a disposal pattern associated with the probable shoreline or edge of marshland that existed at the time of early tannery operations upon the site.

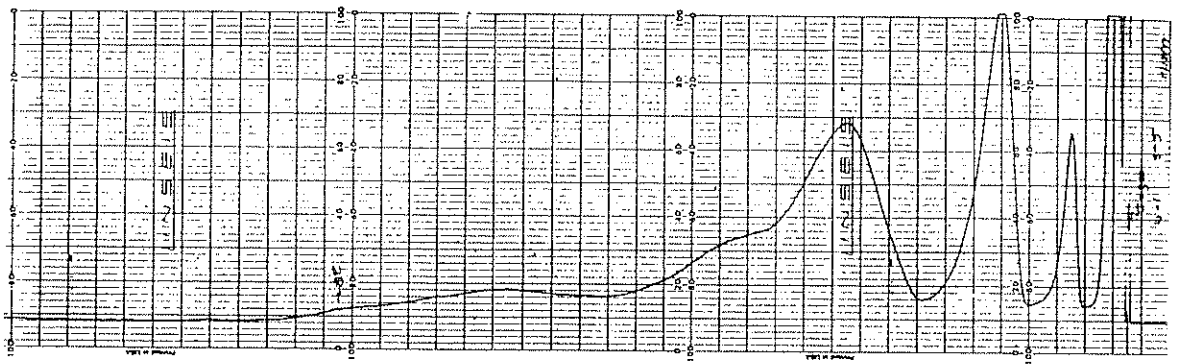
To evaluate the mobility characteristics of the coal tar accumulations noted in the area of S-22/W 23.0, test borings S-24 through S-27 were placed along the southern portion of Wellington project site as shown in Figure 14. Borings S-27 and S-26 were also intended as replacement groundwater receptors for the earlier TRC wells MW-2 and MW-3 which were apparently destroyed during site use activities. Fill material comprised of fine to medium sands, cinder and organic silts were encountered in the upper soil profile of S-27 and, at 9.0 feet, rounded fine to medium sands, suggestive of a former stream bed deposit, preceded clays with intermittent sand lenses to a depth of 15.0'. The presence of rounded fine to coarse sands and the absence of a significant peat layer at S-27 is in sharp contrast to the soil conditions observed during the excavation of test pit W 5.0 immediately to the north and at TP W 26.0. Furthermore, soil characteristics encountered by TRC during the placement of boring MW-2 in this general area revealed a similar stratum to that observed in S-27 with loose, peaty sands atop a well graded coarse sands and trace of gravel to 17.0 feet, where the dense clay layer was encountered.

The similarity in soil conditions at TP W 5.0 and W 26.0, specifically, the presence of a shallow dense peat/marsh grass layer, most likely approximates the shoreline associated with the former creek path. In contrast, soil conditions encountered at the well couplet structure S-24/S-25 and observation well S-26 consisted predominantly of a fill layer in the 4 - 10 (S-26) foot layer underlain by loose organic silts, intermittent layers of fine to medium sands and peat fibers to a depth of 24.0 - 25.0 feet, at which depth silty clays were encountered. Soil conditions and the depth to the clay layer were consistent with those reported at test boring MW-3 indicating a decreasing gradient with respect to clay depths in an easterly direction from S-27 to S-26. During the placement of each of the test borings situated in the southern portions of the Wellington property distinct coal tar odors were encountered in the upper fill regions, particularly in the soils at the 5 - 10 foot depth interval at boring S-26. In addition, a substantial piezometer head differential was observed in the couplet well (3'±), as indicated in Table 3.3.

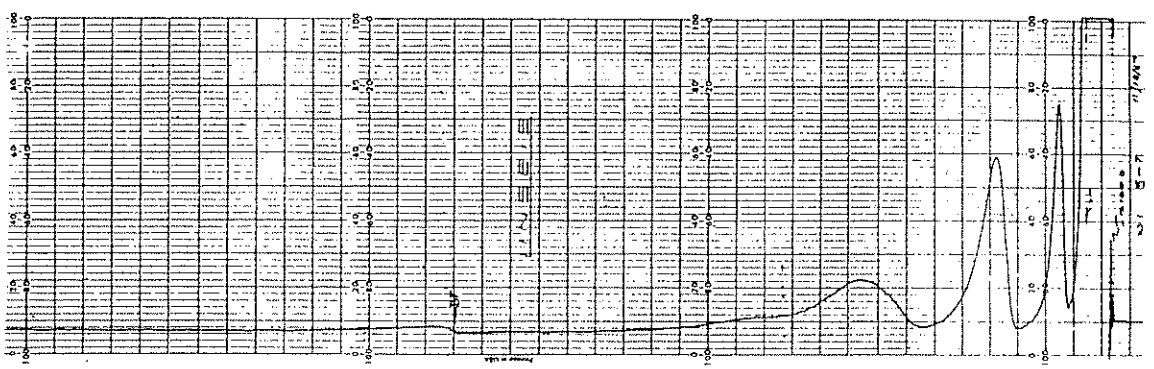
Following the visual inspection of exposed soil conditions within each test pit excavation, representative soil samples were taken and screened for volatile organic compounds as possible indicators of hazardous materials fractions. As indicated previously, a headspace methodology was utilized in this assessment procedure, together with Foxboro 128 Organic Vapor Analyzer relative to a methane standard. The concentrations, summarized within Tables 3.1, 3.2 and 3.4, reflect total concentrations of volatile organic compounds that may be due to both synthetic and natural origin. To delineate the various volatile fractions contributing to the total concentrations detected, OVA analysis was performed in the gas chromatography mode; with the results output to a continuous strip chart recorder.

In general, low to moderate concentrations of VOCs were detected in the soil compartment, with the exception of W 8.0 through W 10.0, where more enhanced indications of organic activity were noted. While OVA analysis revealed predominant fractions due to naturally occurring biochemical activity enhanced by the highly organic nature of in situ sediments, lighter ends associated with coal tar contamination were detected in the shallow soils from test pits W 8.0, W 9.0, and W 12.0. OVA chromatograms associated with the analysis of soil samples from TP W 9.0 and TP W 8.0, presented as Figure 18, illustrate the presence of the BTEX compounds (benzene, toluene, ethylbenzene and xylene) as indications of coal tar contamination. In addition, it is noted that total headspace concentrations detected from the soil sample taken from W 9.0 was approximately three times higher than that of W 8.0, however, the fraction due to synthetic BTEX hydrocarbons were considerably less. This behavior reflects a tendency for the lighter, more volatile methane fractions to influence the headspace analyses performed. Indications of enhanced natural organic activity were also predominantly responsible for the headspace concentrations of 700 ppm detected in the 15 - 17 foot soil split at boring S-23 and concentrations of 120 ppm at 14 - 15 foot split from boring S-24.

TEST PIT EXCAVATION W-8 SOIL SAMPLE @ 4.5 - 6.0'
[VOC] = 350 ppm
11/18/87



TEST PIT EXCAVATION W-9 SOIL SAMPLE @ 6.25 - 6.5'
[VOC] = 1000 ppm
11/18/87



TOTAL HEADSPACE CONCENTATIONS OF VOLATILE ORGANIC COMPOUNDS (ppm)		figure **18**
norwood engineering co. inc., 1410 route 1, norwood, ma.	date MAY 1988	job no. 0065-02

MLDN

000625

In contrast to the soil fingerprint of BTEX compounds, OVA analysis of the 13 - 15 foot split from boring S-22 revealed an elution response which precluded separation of various compounds present. Similar indications were noted during the analysis of soil samples taken from the three foot depth interval at TP W 22.0. Each of these sampling points is situated within the estimated limits of the former creek bed where visual observations suggest the highest potential for coal tar accumulation. To quantify the results of the field investigation and to more accurately delineate the various coal tar constituents present, laboratory analysis was performed on representative soil and groundwater samples from each of these locations and the results are discussed in Section 4.0 of this report.

Two inch slotted and screened PVC monitoring wells were inserted in test borings S-21 through S-27 following an examination of in situ soil strata. At each of these locations the conductivity and temperature of the groundwater were measured for an indication of the total number of dissolved ions present. Conductivity is a measure of the water's ability to carry an electric current and varies with the total number of ions in solution. These measurements are used to detect any variance over normal background levels across the site which may indicate the presence of a concentrated or active source of dissolved solids upon the project site. Groundwater samples were also taken from each of the observation wells and screened using the Century 128 OVA for volatile organic compounds and the Orion 407A for the measurement of pH levels. The results of this analysis are summarized in Table 3.3.

Table 3.1 Total Concentrations of Volatile Organic Compounds*

Sample Description: Soil

18 November 1987

Wellington Properties

Test Pit Excavations

Sampling Location	Depth	VOCs, ppm* Concentrations
W 8.0	0.0' - 1.0'	3.4
	1.0' - 2.0'	110
	2.0' - 3.2'	440
	2.5'	20
	4.5' - 6.0'	350
W 9.0	4.6'	1000
	6.3'	1000
W 10.0	1.0'	18
	5.5'	420
	7.0'	18
W 11.0	1.2'	24
	4.0'	200
	7.0'	18
W 12.0 (Trench**) in a southwesterly direction - 5'	1.5'	0.4
5'	3.0'	82
15'	1.5'	20
15'	3.0'	0.3
15'	1.5'	7.4
25'	3.0'	ND
25'	4.5'	5.2
25'	6.0'	5.8
W 13.0	1.5'	48
	3.5'	ND
	3.4'	1.0
	6.0'	0.2

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

** Test pit W 12.0 is a trench excavation extended in a southwesterly direction with samples taken at five foot intervals along the trench.

Table 3.1 Total Concentrations of Volatile Organic Compounds*
(Continued)

19 November 1987

Wellington Properties

Sampling Location	Depth	VOCs, ppm* Concentrations
W 14.0	1.0' - 1.7'	6.2
	2.7' - 3.0'	3.2
	7.0' - 7.5'	ND
	11.5' - 12.0'	0.2
W 15.0	1.5' - 1.7'	5.2
	3.2' - 3.3'	1.8
W 16.0	1.5'	ND
	3.5'	1.6
	8.0'	0.1
	9.0' - 10.0'	0.1

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

** Test pit W 17.0 was a trench excavation extended in a southwesterly direction with samples taken at three foot intervals along the trench.

Table 3.1 Total Concentrations of Volatile Organic Compounds* (Continued)

20 November 1987

Wellington Properties

Sampling Location	Depth	VOCs, ppm* Concentrations
W 17.0 (Trench**) in a southwesterly direction - 3'	1.5'	1.0
6'	1.5'	0.8
9'	1.5'	ND
3'	3.0'	1.0
6'	3.0'	0.5
9'	3.0'	0.1
	5.5'	ND
	9.0' - 10.0'	1.2
W 18.0	1.5'	0.2
	3.0'	0.1
	7.0' - 8.0'	0.4
	9.0' - 10.0'	0.2
W 19.0	1.5'	0.3
	3.0'	0.7
	5.0'	0.5
W 20.0	3.0'	ND
	3.0'	0.8
	8.5'	0.3
W 21.0	1.5'	ND
	1.5'	5.4
W 22.0	1.5'	0.1
	3.0'	50
	8.0'	16
	8.5'	0.3

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

** Test pit W 17.0 was a trench excavation extended in a southwesterly direction with samples taken at three foot intervals along the trench.

Table 3.1 Total Concentrations of Volatile Organic Compounds* (Continued)

23 November 1987

Wellington Properties

Sampling Location	Depth	VOCs, ppm* Concentrations
W 23.0	1.2'	0.6
	3.0'	ND
	9.0' - 10.0'	1.2
W 24.0	1.0'	ND
	3.0'	1.5
	9.0' - 10.5'	ND
	16.0'	0.3
W 25.0	1.5'	0.6
	3.0'	0.8
	4.0' - 6.0'	ND
	4.0' - 6.0'	ND
	8.0'	0.1
W 26.0	2.5'	0.6
	6.0'	0.1
W 27.0	2.0' - 4.0'	14
W 28.0	2.0'	ND
	4.0'	7.6

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 3.2 Total Concentrations of Volatile Organic Compounds*

Sample Description: Soil

Wellington Properties

Soil Test Borings

Sampling Location	Depth	VOCs, ppm* Concentrations
	17 November 1987	
S-22	0.0' - 3.0'	3.2
	3.0' - 5.0'	4.4
	7.0' - 10.0'	1.2
	13.0' - 15.0'	46
	15.0' - 17.0'	0.6
	17.0' - 19.0'	10+
	20 November 1987	
S-23	0.0' - 3.0'	1.3
	7.0' - 9.0'	0.1
	7.0' - 9.0'	0.1
	15.0' - 17.0'	700
	20.0' - 22.0'	0.1
S-24	0.0' - 3.0'	0.1
	3.0' - 4.5'	ND
	4.0' - 5.0'	0.2
	7.0' - 9.0'	1.0
	13.0' - 15.0'	0.1
	14.0' - 15.0'	120
	20.0' - 22.0'	ND
	25.0' - 27.0'	ND
S-26	0.0' - 3.0'	4.4
	3.0' - 5.0'	0.1
	5.0' - 7.0'	1.1
	10.0' - 12.0'	3.8
	15.0' - 17.0'	0.2
	20.0' - 21.5'	0.1
	21.5' - 22.0'	0.1
	25.0' - 27.0'	ND

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 3.2 Total Concentrations of Volatile Organic Compounds* (Continued)

Wellington Properties

Sampling Location	Depth	VOCs, ppm* Concentrations
	20 November 1987	
S-27	0.0' - 3.0'	0.1
	3.0' - 5.0'	2.0
	5.0' - 7.0'	0.8
	10.0' - 12.0'	0.2
	15.0' - 17.0'	ND
S-28	0.0' - 3.0'	5.2
	5.0' - 7.0'	3.6
	11.0' - 12.0'	4.2
	15.0' - 17.0'	0.2
	16.0' - 17.0'	1.2
	20.0' - 22.0'	0.1
	25.0' - 27.0'	1.0
	30.0' - 32.0'	18
	35.0' - 37.0'	ND
	23 November 1987	
S-29	0.0' - 3.0'	0.2
	5.0' - 7.0'	ND
	10.0' - 12.0'	82
	15.0' - 15.5'	0.4
	15.5' - 17.0'	2.4

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 3.3 Field Analysis for Groundwater Quality Characteristics

Wellington Properties

Sampling Location	Temperature (°C)	Conductivity (@25°C)	Salinity	Depth to Groundwater
		20 November 1987		
W 21.0	9.9	255	1.8	5.0'
Creek	9.5	68	0.5	-
		December 1987		
S-22	12.0	T 10,584 B 16,033	1.0	3.2'
S-23	11.1	5,039	3.2	1.9'
S-26	12.2	T 18,933 B 25,421	15	5.7'
S-27	12	T 9,630 B 29,260	19	4.5'
W 22.0 Field well	11	T 2,394 B 2,014	1.5	5.1'
		15 December 1987		
S-22	Free Bulk Fraction Coal Tars			3.5'
S-23	-	-	-	2.4'
S-26	11.8	1' 409 6' 528	0	6.1'
S-27	10.0 12.0	T 1,342 B 6,342	5 1	5.0'

+ Tidal Fluctuations in static water elevations noted.

B - Bottom of water column +6"
T - Top of water column -6"

Table 3.3 Field Analysis for Groundwater Quality Characteristics (Continued)

Wellington Properties

Sampling Location	Temperature (°C)	Conductivity (@25°C)	Salinity	Depth to Groundwater
		25 May 1988		
S-24	9.5	3,973	2.0	1.6'
S-25	10.0	18,005	2.5	5.0'

Table 3.4 Total Concentrations of Volatile Organic Compounds

Sample Description: Groundwater

Wellington Properties

Sampling Location	VOCs, ppm* Concentrations
November 1987	
W 21.0	-
Creek	-
December 1987	
S-22	1000
S-23	380
S-26	1000
S-27	1000
W 22.0 Field Well	320
December 1987	
S-22	1000
S-23	280
S-24	1000
S-25	1000
S-26	920
S-27	92

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

Table 3.4 Total Concentrations of Volatile Organic Compounds (Continued)

Sample Description: Groundwater

Wellington Properties

Sampling Location	VOCs, ppm* Concentrations
S-24	1000
S-25	1000

* Total VOC concentrations (ppm) in air utilizing headspace methodologies.

GC - Century 128 OVA (FID) - methane standard
ND - None Detected

4.0 Laboratory Analysis

The analytical parameters quantified during this phase of environmental studies were designed to satisfy the scope of the Interim Data Gap Work Plan. In general, the laboratory analysis was performed to quantify parameters that were not amenable to field screening and analytical protocols, specifically, base/neutral, heavy metal and/or cyanide concentrations were quantified to further identify trends observed during the initial studies performed upon the project site. In addition, laboratory analysis for volatile organic compounds was performed utilizing EPA 624 analysis to confirm field analysis performed prior to this study at sample location S-9 in the Lombard/MDPW portion of the site. Laboratory certificates and associated protocol may be referenced from Appendix E.

4.1 Lombard/MDPW Property

In accordance with the recommendations of the Interim Work Plan, laboratory analysis of groundwater quality at sample location S-9 was performed utilizing EPA 624 analysis. The results of this analysis, summarized in Table 4.1, revealed only trace levels of the priority pollutant petroleum indicators benzene, toluene, ethyl benzene, consistent with the field analysis of groundwater quality at this location. The absence of significant concentrations of petroleum hydrocarbons in the groundwater at this location, together with the previous removal of underground fuel storage from the Lombard parcel, suggests that the upgradient source potentials which may adversely impact the residual petroleum contamination encountered at the Lombard/DPW property line is limited.

Prior to the review and approval of the Interim Work Plan by representatives of the Massachusetts Department of Environmental Quality Engineering, a limited scope of field work was performed by Norwood Engineering upon the MDPW property to resolve data gaps revealed by a review of initial site investigations. Site activities performed upon MDPW property included the placement of test pit excavations in eastern portions of the DPW site, followed by field/laboratory analysis of soil and groundwater samples from TP M 23.0, S-10 and S-11. Objectives satisfied by this scope of work included further characterization of coal tar contamination, delineation of probable sources for pH variations noted, evaluation of former dredge spoil basin characteristics and general soil profiles. For the purposes of this summary report, the results obtained from the laboratory analysis of a soil sample from TP M 23.0 for heavy metal compounds and the analysis of a groundwater sample from S-11 for ammonia nitrogen are presented as Tables 4.2 and 4.3, respectively. Of particular note is the concentration of ammonia nitrogen which, together with existing salt storage upon the MDPW property, are most likely related to the fluctuation in pH levels observed.

4.2 Wellington Property

To further define the coal tar contaminant plume configuration across the Wellington property, groundwater samples were taken from existing observation well MW-1, for laboratory analysis with respect to base/neutral compounds. The results of this analysis, summarized in Table 4.4, revealed only trace to non-detectable levels of polynuclear aromatic hydrocarbons (PNAs), at levels consistent with background water quality quantified during the initial site assessment, i.e., less than 200 ppb total PNA. In contrast to the low levels detected at MW-1, significant concentrations of coal tar contaminants, particularly naphthalene (17.31 ppm), as indicated in Table 4.5, were detected at sampling location S-22, which was installed as a part of this study. Naphthalene is a principle priority pollutant component of coal tars and its detection at levels of 17.3 ppm suggests a probable influence due to the disturbance of steady state conditions through well installation and subsequent activation procedures. The evaluation of site conditions during this phase of the study has revealed the presence of in situ geology which appears to enhance the accumulation of coal tar contaminants in the area of S-22. Further details pertaining to the nature of previously existing conditions and the subsequent influence on contaminant profiles detected across the project site are presented in Section 5.0 of this report.

To characterize the source strength and compound profile of coal tar contaminants within the shallow soil compartment, soil samples were taken from TP W 22.0 and TP W 13.0 and analyzed for base/neutral compounds. The results of this analysis, summarized in Tables 4.6 and 4.7, respectively, revealed characteristic coal tar fingerprints at each location, with the additional presence of heavier benzo(a)anthracene, benzo(b)fluorene and benzo(a) pyrene at TP W 22.0.

Previous site investigatory actions performed by TRC revealed significant concentrations of BTEX compounds in a soil sample from TP W 4.0. As indicated in Table 4.8, concentrations of benzene (2.3 ppm), toluene (1.0 ppm), ethyl benzene (15.0 ppm), and xylene (32.0 ppm) were detected, suggesting the possibility of additional contaminant sources upon the site. Accordingly, investigation of potential sources included the underground storage which existed upon the Wellington property at the time of the initial site assessment and former storage areas revealed by the review of the 1936 Barrett Plan of Land. The evaluation of groundwater quality by TRC at the nearest downgradient wells/test pits (MW2 and TP W 4.0 revealed only trace levels of BTEX compounds suggesting a localized condition.

To investigate conditions in the area of TP W 4.0, extensive test pit excavations and field screening of in situ soil and groundwater quality were performed. In addition, laboratory analysis was performed on a groundwater sample from sampling

location S-22 for priority pollutant volatile organic compounds. As indicated in Table 4.9, this analysis revealed the presence of BTEX compounds, however, the concentrations of each of the constituents detected were less than 1 ppm. The results of this investigation have identified the presence of BTEX fractions within the groundwater compartment as indicators of coal tar contamination, however, at much lower levels that the PNA profile. Based upon the proximity of TP W 4.0 to highly contaminated coal tar areas, it is likely that the previous detection of BTEX compounds within this area is attributable to the adsorptive capacity of the soil compartment for coal tar constituents.

Groundwater observation wells S-22, S-23, S-26 and S-27 are estimated to occupy downgradient positions with respect to major portions of the Wellington property. To quantify heavy metal profile for the groundwater leaving the site, laboratory analysis was performed for RCRA 8 compounds upon groundwater samples from S-22, S-26 and S-27. Due to the proximity of S-23 to the former leaching bed, analysis was performed for each of the 13 priority pollutant metals. The results of the heavy metal analyses are summarized in Tables 4.10 through 4.13. At each of these sampling locations concentrations of arsenic were detected in excess of the criteria utilized as guidelines in this environmental site assessment. It should be noted that the Federal Ambient Water Quality Criteria are utilized for characterization of background groundwater quality. These guidelines are not to be considered as the basis for the determination of applicable risk assessment parameters which are dependent upon site specific factors such as the environmental setting, applicable land usage and overall contaminant profile. In general, arsenic concentrations ranged from 0.8 to 0.3 mg/L, as summarized in Table 4.14, with highest concentrations detected at sampling receptor S-23. As indicated in Table 4.11, groundwater concentrations of lead, mercury and nickel at S-23 were also detected at concentrations in excess of the Federal Ambient Water Quality Criteria. EPA criteria referenced in this study are utilized for the characterization of background conditions which vary significantly as a function of land use intensity. Evaluation of heavy metal profiles across southern portions of the site suggests a relationship to the former leaching facility and related effluent disposal practices at this location. With the exception of slightly elevated lead concentrations at sampling location S-26 and S-22, remaining water quality parameters across the Wellington property meet the respective Federal criteria and, in general, are consistent with groundwaters of the New England area.

During test pit excavations to investigate potential underground storage and the trench drainage system associated with coal tar operations in the area of TP W 10.0, a deposit of white chalky material, suggestive of arsenic, was detected. As indicated in Table 4.16, laboratory analysis performed on a representative sediment sample at this location revealed concentrations of arsenic at 1226 ppm. Visual inspection of exposed soil

conditions within TP W 10.0 revealed a wedge approximately 14 inches thick over a length of approximately 8 feet to the westerly limits of TP W 10.0. This excavation was terminated to maintain access to the rear portions of the Wellington facility. This second deposit, together with the additional indications of leather scraps and hide material detected during test pit excavations W 8.0 to W 10.0, suggests a relationship with previous tannery operations performed upon the project site.

As indicated in the interim work plan for the data acquisition on the Wellington property, a principle issue during site investigatory actions is the determination of cyanide concentrations in the soil and groundwater compartment in locations upgradient of Little Creek. To evaluate the potential for leachability of cyanide in the soil compartment, free and total cyanide components were quantified for representative soil samples taken from sampling locations S-22, W 22.0, S-23 and S-27. The results of this analysis revealed free cyanide concentrations in the range of 1 - 3.9 ppm, with the highest concentrations detected in the soil sample taken from the receptor well S-27. As shown on Tables 4.17 to 4.18, a wide fluctuation in total cyanide concentrations was detected across the southern perimeter of the site with significant interference due to competing ions, particularly at sampling location S-23. To assess the potential for groundwater contamination taised by the cyanide detected in the soil compartment, groundwater analysis was performed on samples taken from sampling locations S-22, S-23, S-26 and S-27. As indicated in Table 4.18, cyanide levels ranged from 0.03 mg/L at S-22 to 1.66 mg/L at S-26.

In contrast to the high source potential tentatively identified in the soil compartment at S-23, concentrations of 0.8 mg/L were detected at this location, conversely, higher concentrations of cyanide were detected in the southeast portion of the project site at S-26 and S-27 where the indications of coal tar contamination were noticeably less evident than in remaining portions of the site, particularly S-22, where free phase coal tar contaminants was detected. This contaminant profile suggests that the migration of cyanide is highly influenced by shallow groundwater flow patterns and related water quality characteristics, as opposed to geologic variables which affect coal tar accumulations across the project site. An additional factor that warrants further evaluation is the impact arising from mass transfer within the sediments of Little Creek and its former streambeds, given the nature of subsurface geology encountered during the penetration of these borings and previously quantified concentrations of cyanide (46 mg/kg) in Creek sediments.

Table 4.1 Laboratory Analysis for Volatile Organic Compounds

Sample Description: Groundwater
S-9

(mg/L)

4 December 1987

Methodology	Parameter	Results
624	Benzene	<MDL
624	Toluene	<MDL
624	Ethylbenzene	<MDL
624	1H-Indene	Tentatively identified as present

MDL - Minimum detection limit = <0.025 mg/kg

Table 4.2 Laboratory Analysis for Ammonia Nitrogen

Sample Description: Groundwater
S-11

29 July 1986

Results: 50 mg/l

Table 4.3 Laboratory Analysis for Heavy Metals

Sample Description: Solid Material
TP M 23.0

(mg/kg)

29 July 1986

Methodology	Parameter	Results
206.5	Arsenic	25
208.1	Barium	1,100
213.2	Cadmium	13
218.1	Chromium	224
239.2	Lead	2,340
245.1	Mercury	3
270.3	Selenium	ND
272.2	Silver	3

ND - None Detected

Table 4.4 Laboratory Analysis for Base/Neutral Compounds

Sample Description: Groundwater
MW-1

(mg/l)

7 December 1987

Methodology	Parameter	Results
625	Naphthalene	0.0055
625	Acenaphthylene	0.0034
625	Acenapthene	0.0420
625	Fluorene	0.0520
625	Phenanthrene	0.0480
625	Anthracene	0.0056
625	Fluoranthene	0.0043
625	Pyrene	0.0470
625	Chrysene	Trace

Table 4.5 Laboratory Analysis for Base/Neutral Compounds

Sample Description: Groundwater
S-22

(mg/l)

7 December 1987

Methodology	Parameter	Results
625	Naphthalene	17.310
625	Acenaphthylene	0.189
625	Acenapthene	0.523
625	Fluorene	0.670
625	Phenanthrene	1.380
625	Anthracene	0.523
625	Fluoranthene	0.497
625	Pyrene	0.376
625	Chrysene	0.306

Table 4.6 Laboratory Analysis for Base/Neutral Compounds

Sample Description: Soil
Test Pit W 22.0
6.0' - 7.5'

(mg/kg)

7 December 1987

Methodology	Parameter	Results
625	Naphthalene	935
625	Acenaphthylene	Trace
625	Acenapthene	120
625	Fluorene	247
625	Phenanthrene	973
625	Anthracene	518
625	Fluoranthene	373
625	Pyrene	259
625	Benzo(a)anthracene	519
625	Benzo(b)Fluorene	270
625	Benzo(a)pyrene	466
625	Indeno(1,2,3-co)pyrene	Trace

Table 4.7 Laboratory Analysis for Base/Neutral Compounds

Sample Description: Soil
Test Pit W 13.0
3.0' - 3.5'

(mg/Kg)

7 December 1987

Methodology	Parameter	Results
625	Naphthalene	1,480
625	Acenaphthylene	276
625	Fluorene	350
625	Phenanthrene	1,100
625	Anthracene	190
625	Fluoranthene	286
625	Pyrene	209
625	Chrysene	254

Table 4.8 Laboratory Analysis for Volatile Organic Compounds

Sample Description: Soil
Test Pit W 4.0

(mg/kg)

5 April 1985

Methodology	Parameter	Results*
602	Benzene	2.3
602	Toluene	1.0
602	Ethyl benzene	15.0
602	Xylene	32.0

* As referenced from TRC Environmental Site Assessment Report.

Table 4.9 Laboratory Analysis for Volatile Organic Compounds

Sample Description: Groundwater
Test Pit S-22

(mg/L)

4 December 1987

Methodology	Parameter	Results
624	Benzene	631
624	Toluene	544
624	Ethylbenzene	214
624	Xylene	648

Table 4.10 Laboratory Analysis for Heavy Metals Analysis

Sample Description: Groundwater
Observation Well S-22

(mg/L)

1 December 1987

Methodology	Parameter	Results	Criteria* (mg/L)
206.5	Arsenic	0.092	0.05
208.1	Barium	0.30	1.00
213.2	Cadmium	0.001	0.01
218.1	Chromium	0.145	0.05
239.2	Lead	0.110	0.05
245.1	Mercury	0.003	0.002
270.3	Selenium	<0.005	0.01
272.2	Silver	ND	0.05

Note: * Maximum Concentration of Constituents for Groundwater Protection, as provided in 310 CMR 30.668 Hazardous Waste Regulations.

ND - None Detected

Table 4.11 Laboratory Analysis for Heavy Metals Analysis

Sample Description: Groundwater
Observation Well S-23

(mg/L)

1 December 1987

Methodology	Parameter	Results	Criteria* (mg/L)
204.2	Antimony	0.003	-
206.5	Arsenic	0.306	0.05
210.1	Beryllium	0.008	-
213.2	Cadmium	0.006	0.01
220.1	Copper	0.52	-
218.1	Chromium	0.571	0.05
239.2	Lead	0.614	0.05
245.1	Mercury	0.006	0.002
249.2	Nickel	0.627	-
270.3	Selenium	<0.005	0.01
272.2	Silver	0.001	0.05
279.2	Thallium	ND	-
289.1	Zinc	1.8	-

Note: * Maximum Concentration of Constituents for Groundwater Protection, as provided in 310 CMR 30.668 Hazardous Waste Regulations

Table 4.12 Laboratory Analysis for Heavy Metals Analysis

Sample Description: Groundwater
Observation Well S-26

(mg/L)

1 December 1987

Methodology	Parameter	Results	Criteria* (mg/L)
206.5	Arsenic	0.084	0.05
208.1	Barium	0.26	1.00
213.2	Cadmium	0.001	0.01
218.1	Chromium	0.100	0.05
239.2	Lead	0.070	0.05
245.1	Mercury	ND	0.002
270.3	Selenium	<0.005	0.01
272.2	Silver	ND	0.05

Note: * Maximum Concentration of Constituents for Groundwater Protection, as provided in 310 CMR 30.668 Hazardous Waste Regulations

ND - None Detected

Table 4.13 Laboratory Analysis for Heavy Metals Analysis

Sample Description: Groundwater
Observation Well S-27

(mg/L)

1 December 1987

Methodology	Parameter	Results	Criteria* (mg/L)
206.5	Arsenic	0.161	0.05
208.1	Barium	0.27	1.00
213.2	Cadmium	0.001	0.01
218.1	Chromium	0.178	0.05
239.2	Lead	0.042	0.05
245.1	Mercury	ND	0.002
270.3	Selenium	<0.005	0.01
272.2	Silver	ND	0.05

Note: * Maximum Concentration of Constituents for Groundwater Protection, as provided in 310 CMR 30.668 Hazardous Waste Regulations

ND - None Detected

Table 4.14 Laboratory Analysis for Total Arsenic

Sample Description: Groundwater

(mg/L)

1 December 1987

Observation Well:	Methodology	S-22	S-23	S-26	S-27
Results:	7061	0.092	0.306	0.084	0.161

Table 4.15 Laboratory Analysis for Heavy Metals Analysis - Arsenic

Sample Description: Soil
Test Pit W 11.0
Sample S-10

(mg/kg)

18 November 1987

Methodology	Parameter	Results
7061	Arsenic	1,226

Table 4.16 Laboratory Analysis for Total Arsenic

Sample Description: Soil

(mg/kg)

7 December 1987

Receptor:	Observation Well S-22 (13'-15)	Test Pit W 22.0 (7.5')	Test Pit W 11.0 Sample S-10
Results:	5.225	3.453	1,226

Table 4.17 Laboratory Analysis for Selected Heavy Metals

Sample Description: Soil

(mg/kg)

7 December 1987

Parameter	Observation Well S-22 (13'-15)	Test Pit W 22.0 (7.5')	Observation Well S-23 (3'-5')	Observation Well S-27 (10'-11')	Methodology
Free Cyanide	1.02	2.28	3.86	6.19	412H
Total Cyanide	<1.41	4.11	44.9*	1.87**	421B
Arsenic	5.225	3.453	--	--	304
Phenol	<2.20	--	<2.38	--	510C

* Average of 3 results

** Interference, positive or negative, could not be determined.

Table 4.18 Laboratory Analysis for Total Cyanide

Sample Description: Groundwater

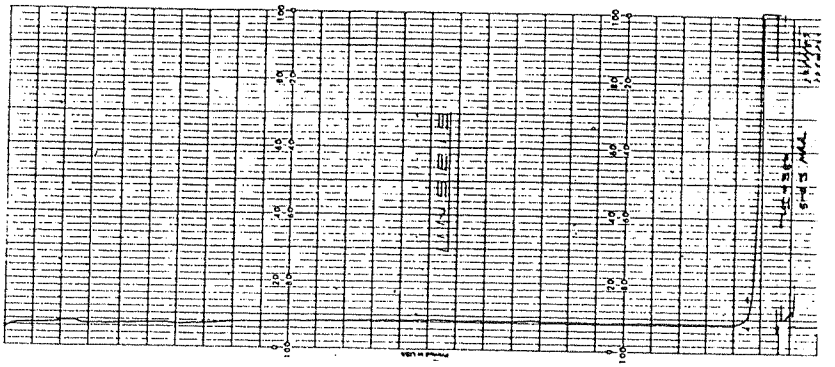
(mg/L)

15 December 1987

Parameter	S-22	S-23	S-26	S-27	Methodology
Total Cyanide	0.03	0.08	1.66	0.65	421B

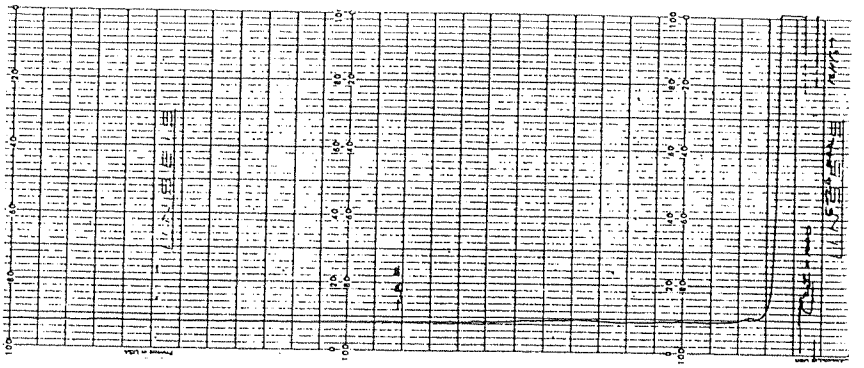
OBSERVATION WELL S-23 GROUNDWATER SAMPLE

[VOC] = 380 ppm
12/1/87



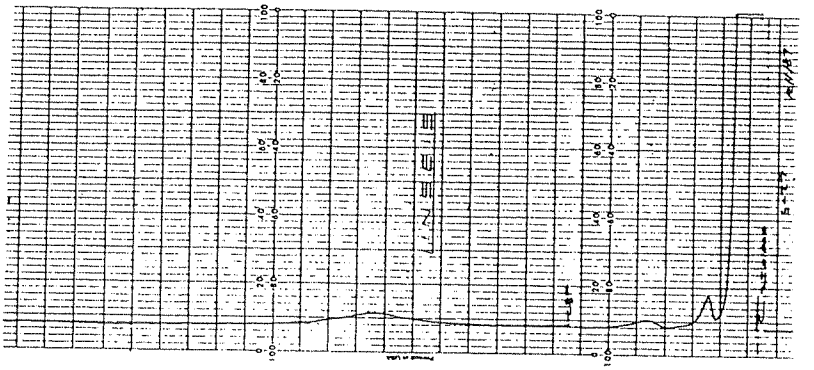
OBSERVATION WELL S-26 GROUNDWATER SAMPLE

[VOC] = 1000 ppm
12/1/87



OBSERVATION WELL S-27 GROUNDWATER SAMPLE

[VOC] = 1000 ppm
12/1/87



TOTAL HEADSPACE CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS (ppm)

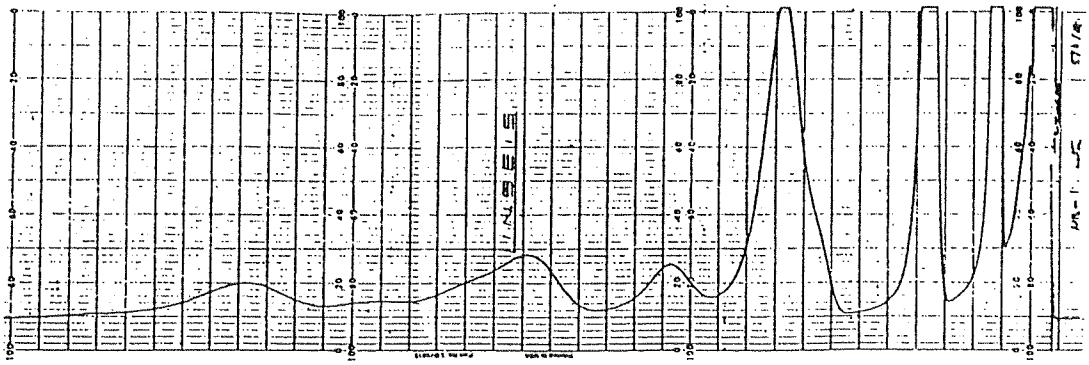
figure **19**

norwood engineering co. inc., 1410 route 1, norwood, ma.

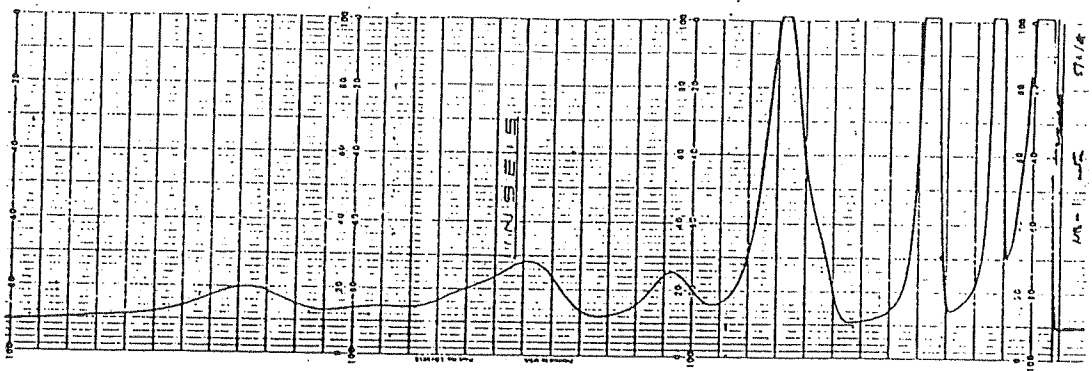
date MAY 1988

job no. 0065-02

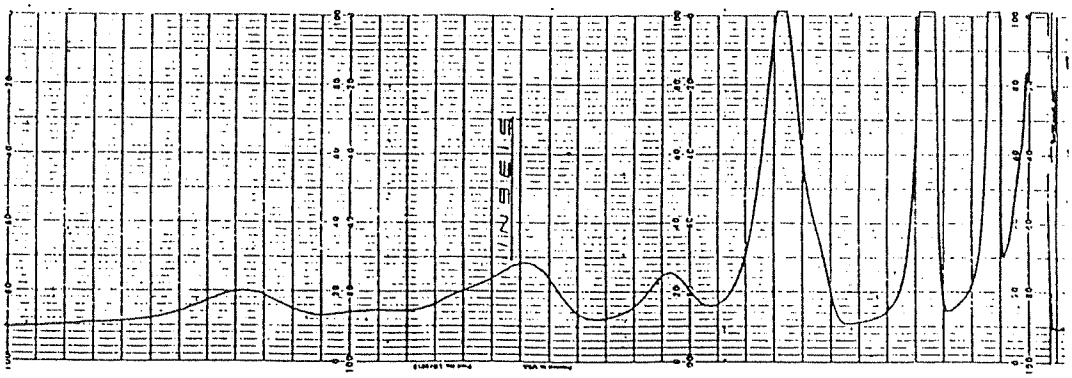
OVA PROFILE – GASOLINE STANDARD



OVA PROFILE – GASOLINE STANDARD



OVA PROFILE – GASOLINE STANDARD



TOTAL HEADSPACE CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS (ppm)

figure **20A**

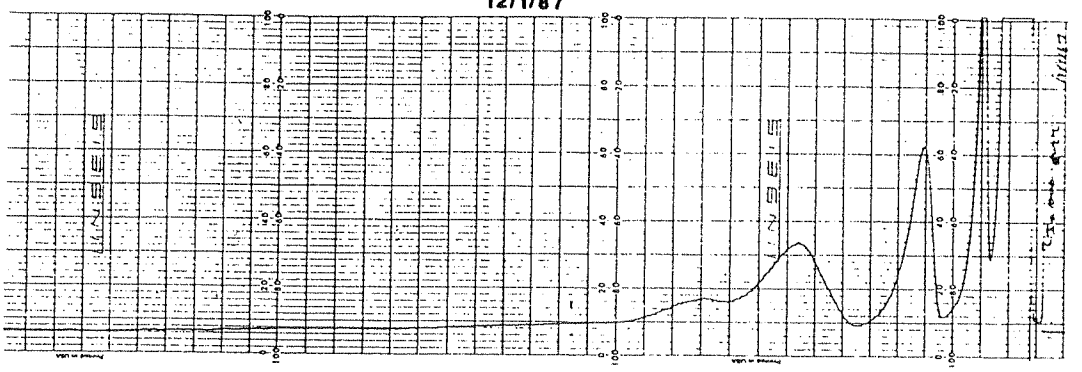
norwood engineering co. inc., 1410 route 1, norwood, ma.

date

job no.

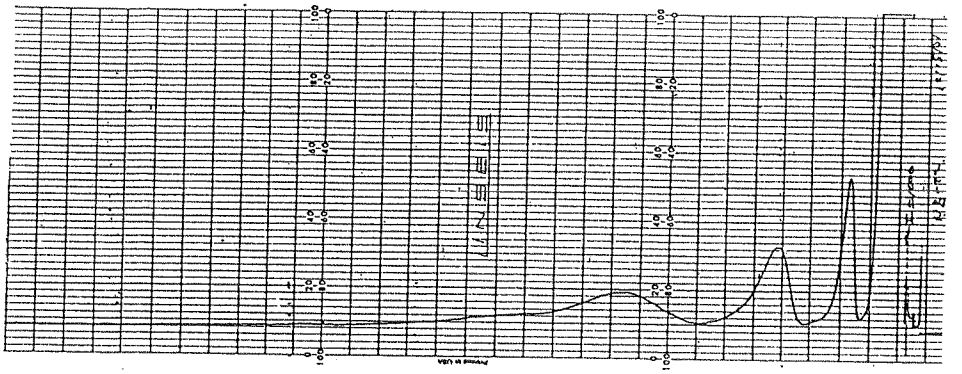
OBSERVATION WELL S-22 GROUNDWATER SAMPLE

[VOC]=1000 ppm
12/1/87



OBSERVATION WELL S-22 GROUNDWATER SAMPLE

[VOC]=1000 ppm
12/15/87



OBSERVATION WELL RMW-2 GROUNDWATER SAMPLE

[VOC]=320 ppm
12/1/87

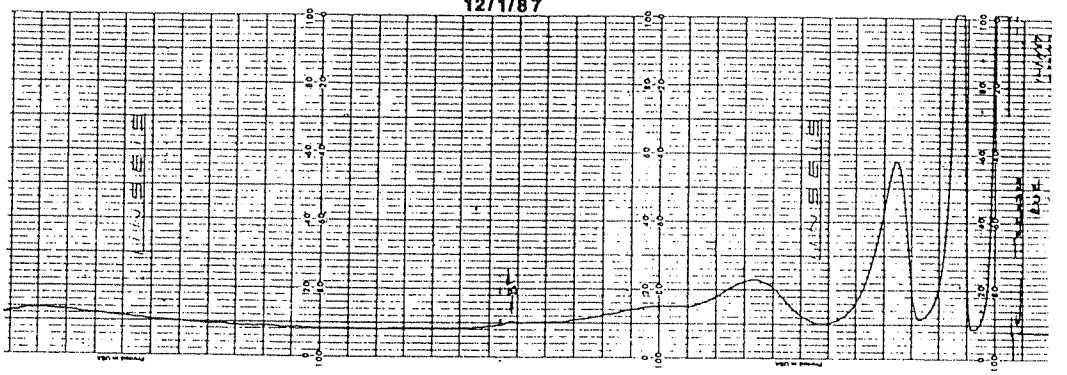


		figure **20**
norwood engineering co. inc., 1410 route 1, norwood, ma.	date MAY 1988	job no. 0065-02

MLDN 000657

5.0 Summary and Discussion

The scope of work performed during this Phase III environmental study was designed to address the elements outlined in the "Interim Work Plan - Data Acquisition, Malden, Massachusetts," which was submitted and approved by representatives of the Department of Environmental Quality Engineering in December of 1987. A primary objective of Phase III site activities was an evaluation of the need for interim remedial measures within areas of localized contamination identified during Phase I and II site activities. In addition, further characterization of site conditions upon the Wellington property was performed, inclusive of any possible effects of site contaminants upon the adjacent surface water body, Little Creek.

The results of soil and groundwater investigations performed at the Lombard/DPW property line have identified areas of residual petroleum contamination which appear to be reflective of prior land usage and whose migration characteristics are highly influenced by in situ geology. In general, the age and diversity of fill material encountered along the Lombard/DPW property line suggest that filling operations have been performed over several time periods, thus, resulting in a permeability variation due to both extent of degradation and the location of fill material placement. While it is typical for the migration of mobile contaminants to show preference for formerly existing watercourses, or zones of higher permeability, no indications of recoverable quantities of bulk petroleum fractions were observed during this study.

As indicated in Section 2.0, visual inspection of in situ soil conditions at the Lombard/DPW property line revealed the presence of highly weathered petroleum hydrocarbons in the soil compartment. During test pit excavations, a short term release, due to the disturbance of steady state conditions, resulted in the sheening of the exposed groundwater compartment. Despite the extent of soil disturbance and the source potential observed in the overlying soil compartment, only low concentrations of weathered petroleum hydrocarbons were detected in groundwater samples taken. This response is indicative of the relatively low volatility associated with the older petroleum present at this location.

Test pits and soil borings placed within the area of Phase II soil excavations (TPM-13) to investigate potentially recoverable petroleum products suggest the presence of a localized condition which does not warrant the implementation of interim remedial actions. Furthermore, it is our professional opinion that site conditions at the MDPW/Lombard property line may be addressed through the implementation of the proposed permanent remedial work plan (alternative 4) that was submitted to the Department upon completion of Phases I and II of this environmental study. This work plan will address any potential for

accumulation of vapors beneath confined spaces, similar to those observed during the initial breaking of overlying asphalt, while minimizing the potential for direct contact with areas of contaminated fill. As a contingency measure, future excavations in this area will be overseen by qualified individuals.

As stated within the Interim Work Plan, one of the purposes of this study was to evaluate the extent of arsenic deposition, reported by TRC during the excavation of TP W 3.0. In the event that arsenic deposits were limited to the area of TP W 3.0 then excavation and removal to an approved DEQE disposal facility was to be implemented as an appropriate remediation alternative. Based upon the presence of additional arsenic bearing materials within the shallow soil compartment of both TP W 10.0 and TP W 25.0, it appears that a more prudent remediation alternative is the implementation of land use control measures to prevent any direct contact or disturbance of existing site conditions. Concurrence with the recommendation was expressed by the DEQE during their inspection of excavations underway in the area of TP W 10.0.

In general, coal tar contaminants detected in the areas of the MDPW/Wellington property line were observed at the transition layer between gravel fill material and the underlying peat formations and, thus, isolated from the groundwater compartment. Furthermore, vertical migration of coal tar constituents retained by the adsorptive capacity of the organic peat layer is further inhibited by underlying dense clays which exist throughout the study region. The observation of residual coal tar fractions within the shallow soil compartment during these Phase III test pit excavations appears consistent with previous site characterization. Probable source origin for the contaminant profile observed includes the former land use operations across southern and eastern portions of the DPW property which involved the on-site accumulation of dredge spoils, as well as various periods of filling to accommodate present site configuration. Based upon the absence of recoverable bulk coal tar fractions and the general immobility of the coal tar constituents, it is our professional opinion that the implementation of interim remedial measures is not warranted.

Contaminant migration and accumulation upon the site is highly influenced by formerly existing site configuration. Details pertaining to the filling operations performed on both the Lombard and Wellington properties are provided from a plan of land entitled, "Plan to Accompany Petition of Richards and Company, Inc. - Permission to Deposit Material on Tidal Creeks of the Malden River," dated June 1925 and presented on Figure 17. Of particular interest were the two cross sections, G - H and J - K, which show approximately 5.5 feet of fill to be placed, with the mean high water mark and a freeboard transition between low high water mark to the top of fill at approximately 15 feet. It must be noted that approximations apply due to the various reproductions involved and the accuracy of plans provided at that

time. The detection of fill material dating back to 1938 within the test pit excavations placed upon the Lombard property indicates that this material was placed prior to the grading activities associated with the former dredge spoil basin.

While the lower reaches of the tributary to the Malden River, which passed through the Lombard/DPW property in 1925 (Figure 17), did not appear to extend as far inland as TP M 25.0, it is probable that related filling operations have influenced conditions in this area. The applicable easements and rights which governed the filling of tidelands in the Lower Commercial Street area may be referenced in Tables 5.1 through 5.3, presented at the end of this section. Review of these easement rights, together with a review of site conditions, presented in Figure 17, suggests that major filling of inland areas was in progress or completed by early 1930s. Furthermore, review of the 1916 through 1936 plans dealing with the Wellington property suggests a wider area of filling along the southern perimeter of the Wellington property in the areas outside of the main streambed. Indications of possible tributaries to the creek area are also delineated on the 1925 Plan of Land.

As indicated in Section 1.0, the work plan proposed for the Wellington property included a more extensive evaluation of the subsurface compartment due to access constraints imposed prior to the implementation of this phase of study. As such, a main objective of site activities upon the Wellington property was the more detailed characterization of contaminant profiles, as well as the necessity for interim remedial actions. Specific issues addressed during the interim work plan included the assessment of bulk coal tar contaminant fractions reported previously in the area of boring B-11 and at W 4.0, the evaluation of cyanide source potential relative to the concentrations detected in the sediments of Little Creek (46 ppm), wells MW-2 (14 ppm) and MW-4 (8.6 ppm), and the evaluation of arsenic deposition as reported in test pit W 3.0.

Soil and groundwater investigations performed upon the Wellington property have identified an area of coal tar accumulation which appears to be related to the former creek which passed through property. Due to the age of the identified source origin and its chemical nature, the migration of coal tar constituents is highly influenced by in situ geology. The results of this Phase III study suggest that conditions in the vicinity of S-22, near the confluence of Little Creek and the former side channel, are a principle area of concern.

While olfactory and visual indications of coal tars were observed in the soil compartment during the placement of test borings S-24 through S-27 and, to a lesser extent, S-23, OVA analysis of groundwater quality indicates that the more mobile BTEX fractions were primarily found in the groundwater compartment in the vicinity of receptors S-22 and RMW-2 (TP W 23.0).

This condition is illustrated graphically on the representative chromatograms for each of the groundwater wells placed along the southern perimeter of the Wellington property, presented as Figures 19 and 20. As shown in the overlay associated with Figure 20, the OVA profile is characteristic of a gasoline fingerprint due to the BTEX fractions present. This condition is noticeably absent in the evaluation of remaining groundwater wells/test pits placed along the southern perimeter of the site.

The presence of coal tar contamination observed in the upper fill layer of borings S-24 through S-27, together with the density of the soils observed in test pit excavations W 5.0, W 26.0 and TRC test boring MW-4, suggests that the migration of coal tars may also be following the formerly existing shoreline configuration. As indicated in the overlay sequence presented as Figure 21, test borings S-27 and S-26 appear to fall within the former streambed configuration, while the well couplet structure is located along the northern edge, as shown. However, comparison of soil types from the deep well of the couplet structure (S-24) with S-26 and MW-3 suggests that the couplet is also situated within the former stream path, particularly due to the presence of fine to medium sands in the 14 - 18 foot depth interval and peat at 18 - 25 foot depth interval of S-24.

Following the field investigative phase of the study, quantification of the OVA analyses was performed utilizing EPA 624 laboratory analysis upon groundwater samples from the observation well at S-22. As indicated in Table 4.4, this analysis confirmed the presence of low concentrations of benzene, toluene, ethyl benzene and xylene. The presence of these compounds is likely to be related, in part, to the disturbance of steady state conditions during well placement. Indications of low concentrations of BTEX fractions were also detected during the excavation of test pits W 8.0 and W 9.0, supporting this contention. As a probable source origin for the coal tars is in excess of 50 years, the potential for a continued release of low concentrations of the BTEX fractions must be appropriately addressed by the permanent remediation alternative.

The analysis of soil and groundwater samples from the southern perimeter of the Wellington property has also revealed the presence of elevated cyanide concentrations which are most likely associated with the former coal gasification operations performed on-site. As the cyanide profile reported in this study is influenced by the accuracy of laboratory analytical work, specific determination of the abiotic factors which are influencing the release of cyanide is premature. It is probable, however, that oxygen content and pH levels are related to the groundwater migration patterns observed. The proposed remediation alternative should incorporate the isolation of shallow

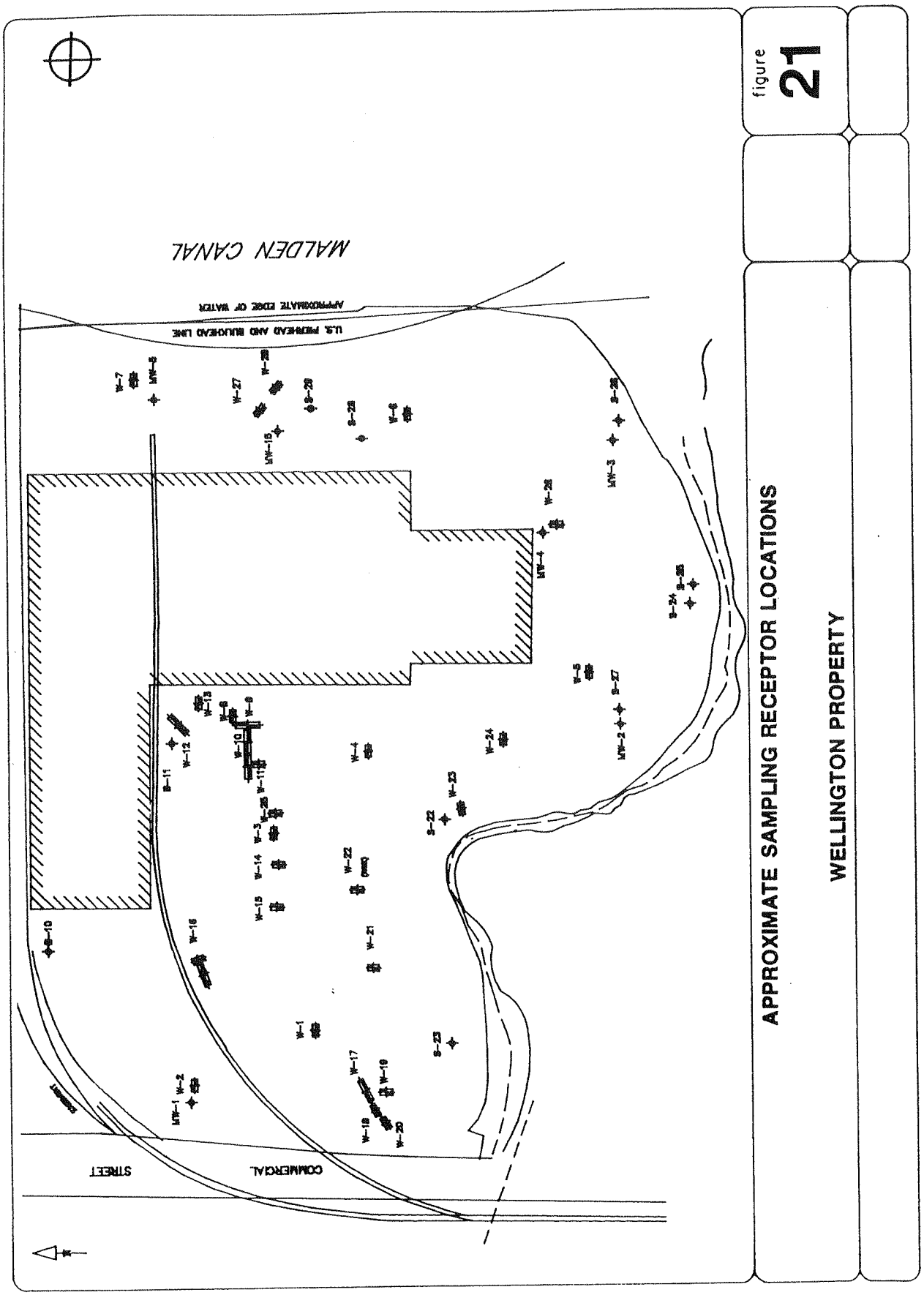


figure 21
APPROXIMATE SAMPLING RECEPTOR LOCATIONS
WELLINGTON PROPERTY
MALDEN CANAL
COMMERCIAL STREET

groundwater movement to enable solidification of coal tar contaminants and further reduce cyanide in groundwater concerns. In the event that more comprehensive measures are warranted, the application of lime or an equivalent pH adjustment material has shown to be an effective method of cyanide stabilization.

Based upon the results of this investigation, it is our professional opinion that additional site activities, beyond those outlined in the proposed remediation work plan, are warranted to address the presence of heavy coal tar accumulations in the area of the former creek. This portion of the site is approximated by the receptor locations W 21.0 through W 24.0. While the implementation of the proposed work plan submitted to the DEQE in April of 1986 will significantly reduce the migration potential of site contaminants, it will not serve to isolate the Little Creek and interior portions of the Wellington property. Indications of this concern are demonstrated by the continued presence of cyanide and BTEX fractions within the groundwaters of the southerly portion of the Wellington property, as well as the characteristic PNA concentrations associated with the coal tars.

The remediation concept which appears to be most appropriate to address the conditions revealed during this study is to mitigate the impact of contaminated areas of the Wellington property on Little Creek. During the next phase, the property owners will continue to monitor site impacts, if any, on Little Creek. Contemporaneously, the property owners will evaluate the technical feasibility and cost-effectiveness of the following remediation options: bioremediation; removal of localized recoverable portions of coal tar constituents in the area of S-22; and the hydraulic isolation of the site from Little Creek.

Given the widespread low level coal tar contamination that exists over major portions of the Wellington property and the heavier accumulations in the area S-22, a consideration that is integral to the implementation of proposed remedial measures upon the site is future land use. In the event that permanent remediation alternatives for the entire study area are not to be implemented in the short term, then the use of more localized remedial measures to address the accumulation of bulk phase coal tar contaminants upon the Wellington property should be performed. Design variables that will require evaluation include the potential for surface water recharge of contaminant areas, the density and distribution of coal tars in loose silt/sediments and recharge of any diversion water that may be collected. Furthermore, the migration of cyanide concentrations towards the confluence of Little Creek and the Malden River would require additional characterization.

Following the completion of risk assessment and feasibility evaluation to address the results of this Phase III study, the selected approach to mitigate conditions upon the Wellington property and within Little Creek should be included within the proposed remedial work plan. The principle components of this work are summarized below and inclusive of the above issues represents the preferred permanent remediation alternative. Key considerations which influence the scope of this work plan are intended land usage and health/safety considerations.

1) Caisson piles to support proposed building structures.

2) Installation of synthetic liner under proposed buildings and an impervious asphalt/clay cap over remaining areas, all of which will be underlain by a gravel moisture barrier.

3) Vapor control measures.

4) Localized remediation of highly contaminated soil regions encountered during site development to enhance site stabilization.

5) Completion of a health and safety work plan for proposed remedial measures.

6) Implementation of a groundwater monitoring and maintenance program.

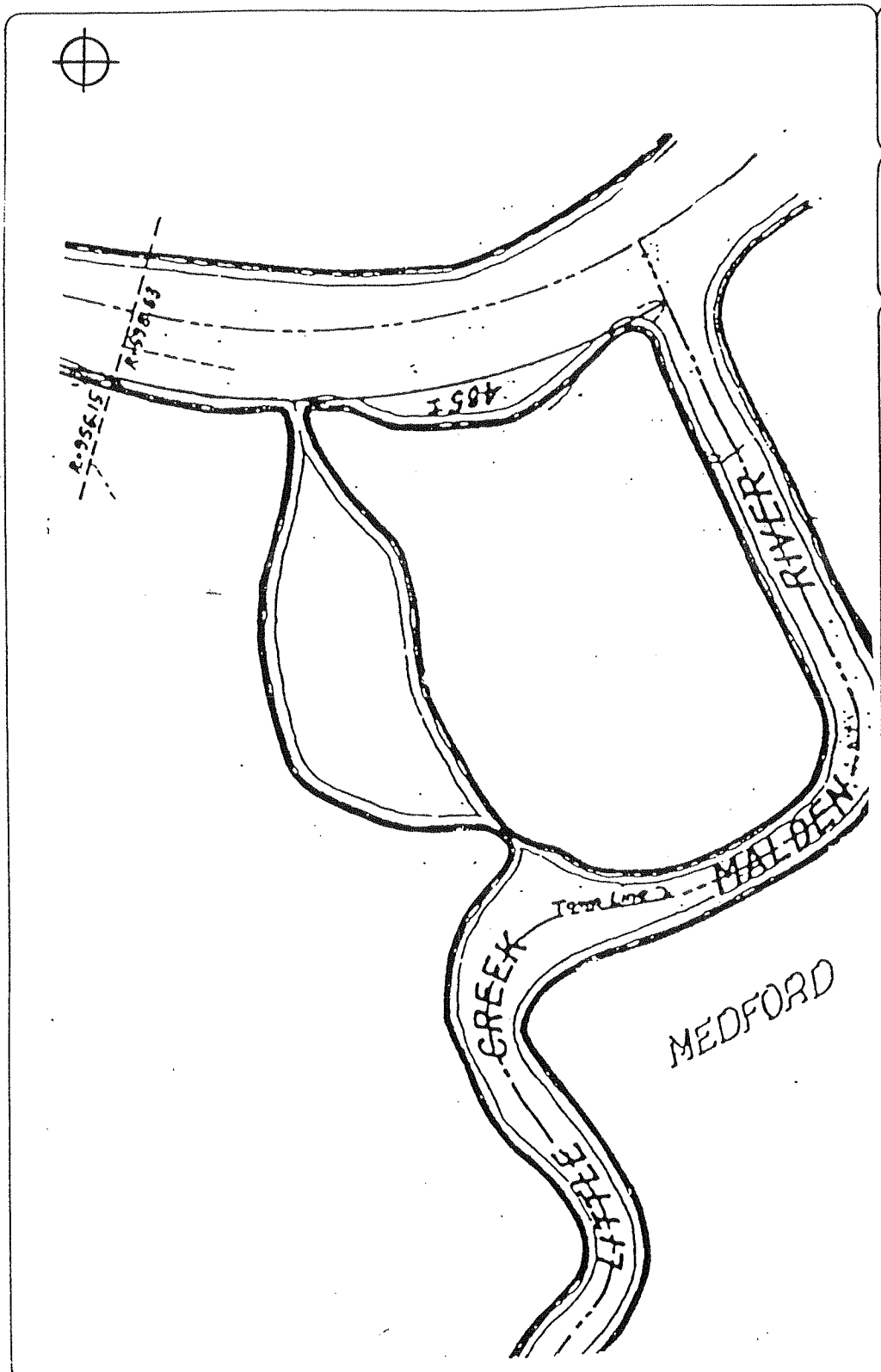


figure 21A

1916 PLAN OF LAND • MALDEN • MA

norwood engineering co. inc., 1410 route 1, norwood, ma.

job no. 0065-02

date MAY 1988

Table 5.1 Summary of Easements, Restrictions, Rights, Etc.

LOMBARD PARCEL (B, B_2)

Date	Land Court Doc. No.	Description of Easement Rights
3/21/17	21118	Easements from Bell Rock to Eastern Metal and Refining Company.[1]
4/3/17	21115	Statement of Appurtenant Rights.
4/14/17	7880	Subject to public rights below mean high water mark and rights to use Malden Canal.
5/29/17	21598	License from Massachusetts DPW to fill solid in and over two tidal creeks connecting with Malden River.
6/20/23	15540	With rights in Commercial St. Ext. and 35' wide way.
9/24/25	63063	License from Massachusetts DPW to fill.
9/6/77	564440	DEQE License to MRA to construct and maintain easement.
11/10/77	564435	U. S. Army Corps of Engineers Permit.
	564443	Order of Conditions
9/10/80	606515	MRA taking of easement to pass over portion of parcel.

[1]Excerpt from LCC 34768 to Richards Company references LCC 21118 as right to fill and deposit waste products.

Table 5.2 Summary of Easements, Restrictions, Rights, Etc.

MALDEN DPW PARCEL (C, C_1)

Date	Land Court Doc. No.	Description of Easement Rights
3/21/17	21118	Easements from Bell Rock to Eastern Metal and Refining Company.[1]
4/3/17	21115	Statement of Appurtenant Rights.
4/14/17	7880	Subject to public rights below mean high water mark and rights to use Malden Canal.
9/28/21	12939	Eastern Metal & Refining to Richards & Company Inc. with all rights.
9/24/25*	63715	License from Massachusetts DPW to FILL solid in and over two tidal creeks connecting with Malden River.
10/9/25	20382	Richards & Company, Inc. to Richards Company, Inc. with all rights.
6/6/32*	34735	Right to pass and repass over the parcel of land lying between easterly property line and westerly channel line established by U.S. River and Harbor Act approved 3/4/15. Right to build docks and wharves on or over parcel and excavate as necessary in connection with the erection and maintenance of docks and wharves right to lay vessels.
6/14/32	34768	Right to use Commercial Street, Commercial Street Ext. and 35' way.
8/22/32	120831	Richards Company to Barrett Company, Massachusetts DPW license to fill only to apply to parcel C_2.
9/6/77	564440	DEQE to MRA license to construct and maintain embankment.
9/6/77	564443	Order of Conditions from City of Malden Conservation Commission.
11/10/77	564435	U.S. Army Corps of Engineers permit.

*Malden DPW parcel conveyed as Parcel C_1 from Parcel C June 1932.
*Wellington parcel conveyed as Parcel C_1 from Parcel C June 1932.

[1]Excerpt from LCC 34768 to Richards Company references LCC 21118 as right to fill and deposit waste products.

Table 5.3 Summary of Easements, Restrictions, Rights, Etc.

WELLINGTON PARCEL (C, C_2)

Date	Land Court Doc. No.	Description of Easement Rights
3/21/17	21118	Easements from Bell Rock to Eastern Metal and Refining Company.[1]
4/3/17	21115	Statement of Appurtenant Rights.
4/14/17	7880	Subject to public rights below mean high water mark and rights to use Malden Canal.
9/24/25*	63715	License from Massachusetts DPW to FILL solid in and over two tidal creeks connecting with Malden River.
6/6/32*	34735	Right to pass and repass over the parcel of land lying between easterly property line and westerly channel line established by U.S. River and Harbor Act approved 3/4/15. Right to build docks and wharves on or over parcel and excavate as necessary in connection with the erection and maintenance of docks and wharves right to lay vessels.
6/14/32	34768	Right to use Commercial Street, Commercial Street Ext.and 35' way.
8/22/32	120831	Richards Company to Barrett Company, Massachusetts DPW license to fill only to apply to parcel C_2.
3/18/42	50516	To Allied Chemical - refers to LCC 21118 as granting easement to Fill and Deposit Waste Products.
7/2/65	118129	To Wellington Realty with all above rights.

*Malden DPW parcel conveyed as Parcel C_1 from Parcel C June 1932.
*Wellington parcel conveyed as Parcel C_1 from Parcel C June 1932.

[1]Reference in LCC 34768 to rights contained in LCC 21118 fill and deposit waste products

Table 5.3 Summary of Easements, Restrictions, Rights, Etc.
(Continued)

WELLINGTON PARCEL (C, C_2)

Date	Land Court Doc. No.	Description of Easement Rights
9/6/77	564440	DEQE to MRA license to construct and maintain embankment.
9/6/77	564443	Order of Conditions from City of Malden Conservation Commission.
11/10/77	564435	U.S. Army Corps of Engineers permit.
4/18/78	572637	Extension of Order of Conditions from the City of Malden Conservation Commission.
1/19/81	585256	Certificate of Compliance by Malden Conservation Commission.

[1]Excerpt from LCC 34768 to Richards Company references LCC 21118 as right to fill and deposit waste products.

APPENDIX A

Interim Work Plan - Data Acquisition
Malden, Massachusetts

Wellington Property

(*) 1. Delineation of Bulk - free floating coal tars.

a. Minimum of six test pit excavations in the area of test pits W-3, W-4 and B-11, with additional investigation along the northern property line adjacent to the main building.

b. Base Neutral (625) analysis on representative soil samples.

c. Representative 624 analysis for volatile organic compounds.

d. Recovery of bulk free floating coal tars through localized remediation.

e. Transmissivity/permeability studies in areas of possible groundwater recovery.

(*) 2. Investigation of possible arsenic deposits during item (1) test pit excavations and removal to approved off site disposal facilities.

3. Installation of three (3) groundwater observation wells along Little Creek.

    a. Analysis of each receptor, plus MW2, MW3 and MW4 for cyanide and selective metals.

    b. Base neutral analysis on groundwater sample from receptor downgradient of test pits W-3, W-4 and W-1.

4. Soils investigations for heavy metals in the area of the former filter bed.

5. Installation of (1) groundwater observation well in the area of test pit W-6. Metals and cyanide analysis of representative groundwater sample.

6. Base neutral and cyanide analysis - groundwater sample from MW1.

7. "Detailed" review of previous site history on Wellington Parcel to supplement field investigation.

Table 1.0

Laboratory Analysis - Ammonia Nitrogen
Malden DPW Well S-11

29 July 1986

Results: Ammonia-Nitrogen 50 mg/l

Table 2.0

Laboratory Analysis - Heavy Metals mg/g
Solid Material
Malden DPW Test Pit 22.0

Methodology	Parameter	Results
206.5	Arsenic	0.025
208.1	Barium	1.10
213.2	Cadmium	0.013
218.1	Chromium	0.224
239.2	Lead	2.340
245.1	Mercury	0.003
270.3	Selenium	0.000
272.2	Silver	0.003

APPENDIX B

APPENDIX C

Soil Logs

City of Malden, Department of Public Works Yard

Malden, Massachusetts

Test pits M 25.0 and M 26.0 were excavated through the use of a Case 580D extendahoe backhoe from Charles Construction, while the subsequent test pit excavations, M 27.0 through M 36.0, were performed with a Gradall excavator.

Test Pit M 25.0

Test pit M 25.0 was initiated 42'± to the north of the northeastern corner of the DPW garage and extended 30' in an easterly direction.

0.0' - 0.3'	Two layers of bituminous concrete.
0.3' - 0.8'	Brown fine to coarse sandy gravel fill.
0.8' - 2.5'	Brown fine to coarse sand and gravel fill mixed with various amounts of silt, brick, rubber gaskets and metal strips.
2.5' - 5.0'	Black sandy fill containing ashen debris, bottles, tin cans, bricks.
5.0' - 5.5'	Lens of gray-green silt.
5.5' - 7.0'	Ash, paper, stones, rock fragments, wood and rubber debris within a black sandy gravel fill, predominance of glass bottles (medicine, ink wells, alcohol, soft drink, milk and ceramics) and some shoe parts.
7.0' - 10.0'	Trashy fill debris with metal and wood scrap.

Note: This test pit is a trench cut excavation commencing at TRC test pit M-13 and extending in an easterly direction towards TRC test pit M-12. At three sections of the trench cut for TP M 25.0 the excavations were extended to 10.0'± to accommodate of groundwater sampling, as well as evaluation of differing fill material. The middle cut (B) contained a higher fraction of shoes and shoe parts in the deeper fill, in addition to 1 - 1.5' diameter hose sections and some brick. Newspaper remnants recovered referenced December 14, 1938. The easternmost deep cut (C) contained noticeably less glass, large sheets of rubber pattern scrap and badly decomposed metal containers. Groundwater accumulated in the open excavations at varied depths of 7.0' (A) and 8.6' (B and C), respectively. A slight sheen was observed on the groundwater surface at each location sampled (A - C) and a light petroleum odor was noted. No bulk phase petroleum fractions noted.

Test Pit M 26.0

Test pit M 26.0 was located 42'± north of the northeastern corner of the DPW garage and extended 8' in a westerly direction.

0.0'	0.3'	Two layers of bituminous concrete.
0.3'	0.8'	Brown fine to coarse sandy gravel fill.
0.8'	2.5'	Brown fine to coarse sandy gravel fill containing silt and brick debris.
2.5'	8.0'±	Black ashen fill and trash containing a predominance of metal stripping, with portions of a 55 or 30 gallon drum, rock fragments, rubber scrap, and bottles. A narrow lens (0.5') of gray-green silt was observed at 5.0'±.

Note: Groundwater entered at 6.8' exhibiting a noticeable sheen and odor typical of a petroleum product, no bulk phase petroleum fractions noted.

Test Pit M 27.0

Test pit M 27.0 was excavated 42' north and 16' west of the corner of the DPW garage.

0.0'	0.3'	Two layers of coarse bituminous concrete.
0.3'	1.0'	Light brown, fine, sandy gravel.
1.0'	2.5'	Dark brown to black fine to medium gravel; aggregate generally round to subangular.
2.5'	7.0'	Indications of a burning dump; ashen layer with intermittent lenses of broken bottles, brick and wood fragments, black organic material and tin strips.

Note: Groundwater enters at 6.8'. Black silty, with an odor similar to a weathered oil or heavy organic material and sheen across the surface of the accumulated water. The upper 0.5' - 1.0' of the ashen fill was very compact and cemented suggestive of seasonal or intermittent periods of burning. A slotted 4" PVC pipe was installed as a temporary recovery well to evaluate any potential for accumulation of bulk phase petroleum fractions.

Test Pit M 28.0

Test pit M 28.0 was located 18'± northwest of TP M 27.0.

0.0'	- 0.3'	Two layers of coarse bituminous concrete.
0.3'	- 1.0'	Light brown fine gravel fill.
1.0'	- 2.5'	Dark brown to black fine to medium gravel; aggregate generally round to subangular.
2.5'	- 7.0'	Ashen debris with partially burned linoleum fragments amidst intermittent lenses of broken bottles, brick and wood fragments, black organic material and tin strips. Lens of dry white, chalky material also noted, which appears to be sodium or calcium hydroxide.
7.0'	- 7.5'	Light brown-green medium sand.
7.5'	- 10.0'±	Brown, fine with trace medium gravel and very fine with trace of silty sand; aggregate fragment grain shape subangular to angular.

Note: Groundwater enters at 7.5'±, black color and ashen film.

Test Pit M 29.0

Test pit M 29.0 was located 125'± to the south of the southeast corner of the DPW garage and extended 35'± westerly.

0.0'	- 0.4'	Bituminous concrete.
0.4'	- 2.0'	Brown sandy gravel fill.
2.0'	- 4.0'	Black sandy gravel and slag.
4.0'±		Red peat.

Note: Groundwater enters atop the peat and seeps out from the upper gravel lens. Slight odor indicative of a weathered petroleum product.

Test Pit M 30.0

Test pit M 30.0 was located 125'± south and 25'± east of the southeast corner of the DPW garage and extended 20'± in a westerly direction.

0.0'	- 0.2'	Salt/sand residual.
0.2'	- 2.0'	Brown sandy gravel fill.
2.0'	- 5.0'	Black sandy gravel with slag, pipe section, cobbles and pieces of asphalt.
5.0'±		Red peat.

Note: Groundwater enters atop the peat. Dark, silty sheening observed atop groundwater with slight coal tar odor.

Test Pit M 31.0

Test pit M 31.0 was excavated at the edge of the concrete pump island; approximately 125'± south and 35'± west of the southeast corner of the DPW garage and extended 25'± in a westerly direction.

0.0'	- 2.0'	Brown fine to coarse sandy gravel fill.
2.0'	- 5.0'	Black sandy gravel with evidence of aqueous coal tar contamination.
5.0'±		Red peat with some fine to medium gray sand.

Note: Groundwater enters atop the peat. Dark, silty sheening observed atop groundwater with a slight coal tar odor.

Test Pit M 32.0

Test pit M 32.0 was located 200'± east and 125'± south of the southeast corner of the DPW garage.

0.0'	- 5.0'	Brown sandy gravel fill containing concrete blocks, rebar, slag and brick fragments.
5.0'±		Yellow straw peat, with gray-brown organic silts.

Note: Groundwater enters atop the peat. Trace of sheening atop groundwater most likely incurred by test pit excavation. Organic odor noted with an absence of previously observed coal tar indications. 30" culvert encountered at 2.5'.

Test Pit M 33.0

Test pit M 33.0 was located 120'± east and 125'± south of the southeast corner of the DPW garage and extended 20'± in a westerly direction.

0.0'	- 2.0'	Brown sandy gravel fill.
2.0'	- 4.0'	Black sandy gravel typical of coal tar contamination with slag, brick, large pieces of concrete mixed in the fill. Layer of stone just atop the peat.
4.0'±		Red peat.

Note: Groundwater enters atop the peat. Slight sheening atop groundwater.

Test Pit M 34.0

Test pit M 34.0 was located 90'± south and 15'± west of the southwest corner of the DPW garage.

0.0'	- 0.4'	Bituminous concrete.
0.4'	- 1.0'	Brown sandy gravel fill.
1.0'	- 3.1'	Black very dense sandy gravel fill with building debris including concrete, brick, 2.5' x 8" diameter metal roller bars. Intermittent pockets of gray-green silt at north end.
3.1'	- 3.8'	Black gravel fill with slag and evidence of coal tar contamination.
3.8'±		Red peat.

Note: Groundwater enters very slowly atop the peat. Black sheening evidenced a slight odor similar to a weathered petroleum product. Test pit material was unstable below 3'.

Test Pit M 35.0

Test pit M 35.0 was located 15' to the west of the northeast corner of the DPW garage.

0.0'	- 0.4'	Two layers of bituminous concrete.
0.4'	- 1.0'	Brown fine to medium sandy fill.
1.0'	- 7.5'	Black-gray coarse gravel fill with debris including slag, brick, wood and asphalt. A partial layer of asphalt was observed at 2.8' and a lens of gray silt at 3'±
7.5'±		Gray/black organic silt with yellow peat fibers.

Note: No groundwater; no unusual odors.

Test Pit M 36.0

Test pit M 36.0 was located at the northeast corner of the DPW garage parallel to and approximately 20 feet south of TP M 25.0.

0.0'	- 0.4'	Two layers of bituminous concrete.
0.4'	- 1.0'	Brown fine to medium sandy fill.
1.0'	- 1.5'	Dark brown fine to coarse sands and gravel, with cobbles, bricks and traces of slag and red stone.
1.5'	- 2.5'	Gray fine to coarse sands and gravel, with cobbles and small boulders.
2.5'	- 8.0'	Dark brown fine to coarse sands and gravel, with cobbles and trashy debris; brick, wood, rubber coated chain and asphalt.
8.0'	- 8.5'	Dark gray-black organic silts with debris; slag, brick, wood, porcelain, and fibrous peat.

Note: No groundwater; no unusual odors. Trashy debris appears to be confined atop the peat layer.

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE R I

SHEET 1 OF 1
DATE
HOLE NO NB-14
LINE & STA
OFFSET
SURF. ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO
OUR JOB NO 88-435

GROUND WATER OBSERVATIONS
At 9' on Rods after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/16/87	
COMPLETE	11/16/87	
TOTAL HRS.		

BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock - color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample						Brown fine to medium SAND & Gravel & Silt (Fill), some Cement & Brick	1	36"	-
		5'-6'6"	D	5	5	3		9'		2	18"	6"
		10'-10'6"	D	1	-	-		10'6"	Black Old Fill	3	6"	4"
		10'6"-11'6	D	-	1	1		15'	Black to Gray (1") Layer fine to medium SAND, then organic Silt, trace of fibers	3A	12"	12"
		15'-16'6"	D	4	5	6		16'6"	Gray fine to coarse SAND & organic Silt mixed	4	18"	12"
									Bottom of Boring 16'6"			
									Installed (2" PVC) Monitor Well at 15'			
									10'-Slotted 5'-Solid Ottawa Sand 1/4-Bentonite Balls 1/4-Bag of Cement 1-Road Box			

GROUND SURFACE TO 15' USED H/S/A CASING THEN ____ S/S to Bottom

Sample Type
D-Dry C-Cored W-Washed
UP-Undisturbed Piston
TP-Test Pit A-Auger V-Vane Test
UT-Undisturbed Thinwall

Proportions Used
trace, 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2" O.D Sampler
Cohesionless Density
0-10 Loose
10-30 Med Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff

SUMMARY
Earth Borings 16'
Rock Coring -0-
Samples 4
HOLE NO

MLDN 000682

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO NB-15
LINE & STA
OFFSET
SURF ELEV

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ. NO
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At 8' in Auger after ___ Hours
At ___ after ___ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/16/87	a m / p m
COMPLETE	11/17/87	a m / p m

TOTAL HRS.
BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From - To: 0-6	6-12	12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-2'	Auger Sample						Brown to Black fine to medium SAND & Gravel & Brick & Cement (Fill)	1	24"	-
		5'-6'6"	D	17	8	5			(trace of oil noted through out remainder of	2	18"	9"
				100/2"				6'6"	Boring)			
		8'-8'6"	D	120	-	-			Possible Cement	3	6"	6"
		10'-12'	D	24	14	14		10'				
				12					Dark Brown fine to medium SAND, some organic Silt	4	24"	12"
		12'-14'	D	5	2	3		13'		5	24"	18"
				4				13'6"	Brick Fragments mixed in			
								14'6"	Black organic SILT			
		15'-17'	D	10	10	17			Brown Gray fine to medium SAND, some organic Silt,	6	24"	18"
				12				17'	trace of Fiber & Sea Shells			
									Bottom of Boring 17'			

GROUND SURFACE TO 15'. USED H/S/A CASING THEN S/S to Bottom

Sample Type
D: Dry C: Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2" O.D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med Dense; 30-50 Dense; 50+ Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V-Stiff; 30+ Hard

SUMMARY
Earth Borings 17'
Rock Coring -0-
Samples 6

HOLE NO NB-15

MLDN 000683

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO NB-16 & 17
LINE & STA
OFFSET
SURF. ELEV

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ. NO.
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At _____ after _____ Hours
At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A		
Size, D			
Hammer Wt			BIT
Hammer Fall			

	Date	Time
START	11/17/87	am pm
COMPLETE	11/18/87	am pm

TOTAL HRS.
BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6 / To 6-12 / 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-2'	Auger Sample			NB-16	Augered to 2'	1	24"	-
							Hard FILL, Cement & Boulder			
							Brown fine to medium Sand			
						2'	& Gravel			
							Bottom of Boring 2'			
							(Client ended Boring)			
		0'-2'	Auger Sample			NB-17	Black fine to medium SAND	1	24"	-
							& Silt (Fill), some Gravel			
						2' -	to coarse Sand & Gravel			
							(Fill) some Cobbles to			
						3'6"-	fine to medium Sand &			
						5'	Gravel & Brick, some Wood			
		5'-7'	Auger Sample				Black fine to medium SAND	2	24"	-
						7'	& Gravel, some Silt			
							Bottom of Boring 7'			
							2 - Auger Teeth			

GROUND SURFACE TO 7' ; USED H/S/A CASING. THEN

Sample Type
D: Dry C: Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thin-wall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2 O.D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY
Earth (Bore) 7'
Rock Coring -0-
Samples

HOLE NO NB-16+17

MLDN 000684

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE R I

SHEET 1 OF 1

TO Norwood Engineering | ADDRESS Norwood, Mass. | DATE

PROJECT NAME Monitor Wells @ Town DPW- | LOCATION Malden, Mass. | HOLE NO NB-18

REPORT SENT TO Above / DPW Way | PROJ NO | LINE & STA.

SAMPLES SENT TO Taken At Site | OUR JOB NO. 88-435 | OFFSET | SURF. ELEV.

GROUND WATER OBSERVATIONS

At 8' on Rods after / Hours

At after Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11-17-87	a m / p m
COMPLETE	11-17-87	a m / p m
TOTAL HRS		
BORING FOREMAN	C. Broullette	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From – To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-2'	Auger Sample						6" Brown FILL fine to medium SAND & Gravel	1	24"	-
		5'-7'	D	8	4	5			Black fine to medium SAND & Gravel & Silt & Cobbles, some Brick & Wood (Trash Fill)	2	24"	6"
				13				8'				
		10'-11'6"	D	4	4	4			Black (Same) with oil mixed (Strong Chemical Odor noted)	3	18"	12"
								13'				
		15'-17'	D	4	3	4			Grayish Organic SILT, some fiber	4	24"	24"
				5				17'				
									Bottom of Boring 17' Installed (2" PVC) Monitor Well at 15'			
									10'-Slotted			
									5'-Solid			
									5-Bags of Ottawa Sand			
									1/4-Bentonite Balls			
									1/4-Cement			
									1-Road Box			

GROUND SURFACE TO 15' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D: Dry C: Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT Undisturbed Thinwall

Proportions Used
trace 0% to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2 O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY
Earth Borings 17'
Rock Coring -0-
Samples 4

HOLE NO

MLDN 000685

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO NB-19
LINE & STA
OFFSET
SURF. ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO.
OUR JOB NO 88-435

GROUND WATER OBSERVATIONS
At ____ after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I.D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/17/87	a m / p m
COMPLETE	11/18/87	a m / p m

TOTAL HRS.
BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Per	Rec
		0'-3'	Auger Sample						3" Blacktop, Dark Brown to Black fine to medium SAND & Gravel (Fill)	1	-	
								5'				
		5'-7'	D	2	2	5			Black fine to coarse SAND & Gravel & Rubble (Fill)	2	24"	12"
								7'	to Cinder & Old Fill			
									Organic SILT & Trash mixed & Strong Odor, some Oil & Steel (Used Respirator from 10' on)	3	24"	4"
		10'-12'	D	2 2	2	3						
								15'6"		4	18"	18"
		15'-16'6"	D	6	10	16						
								16'6"	Dark Brown fine to medium SAND & organic Silt, some fiber mixed & oil			
									Bottom of Boring 16'6"			
									Installed (2" PVC) Monitor Well at 15'			
									10'-Slotted 5'-Solid 5-Bags of Ottawa Sand 1/4-Bentonite Balls 1/4-Bag of Cement 1-Road Box			
									(Used Respirator)			

GROUND SURFACE TO 15' USED H/S/A "CASING THEN S/S to Bottom

Sample Type
D-Dry C-Cored W-Washed
UD-Undisturbed Piston
TP-Test Pit A-Auger V-Vane Test
UT-Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY
Earth Boring 16'6
Rock Coring -0-
Samples 4

HOLE NO NB-19

MLDN 000686

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET ____ OF ____

TO Norwood Engineering | ADDRESS Norwood, Mass.
PROJECT NAME Monitor Wells @ Town DPW- | LOCATION Malden, Mass.
REPORT SENT TO Above / DPW Way | PROJ NO
SAMPLES SENT TO Taken At Site | OUR JOB NO 88-435

DATE
HOLE NO NB-20
LINE & STA
OFFSET
SURF ELEV

GROUND WATER OBSERVATIONS
At ____ after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/18/87	a.m.
COMPLETE	11/18/87	p.m.
TOTAL HRS.		

BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From / To 0-6	6-12	12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample						3" Blacktop-Brown fine to medium SAND & Gravel & Trash & Cinder (Fill) some Silt & Clay mixed	1	36"	-
		5'-7'	D	6	7	8				2	24"	18"
				6				9'6"				
		10'-12'	D	1 for 24"					PEAT to Black fine to medium Sand & Peat mixed	3	24"	24"
								13'				
									Gray fine to coarse SAND			
		15'-16'6"	D	15	20	24		16'6"		4	18"	18"
		16'6"-17'	D	-	-	30		17'	Yellow CLAY, trace of Silt	4A	6"	6"
									Bottom of Boring 17' Installed (2" PVC) Monitor Well at 15'			
									10'-Slotted 5'-Solid 5-Bags of Ottawa Sand 1/4-Bentonite Balls 1/4-Bag of Cement 1-Road Box			

GROUND SURFACE TO 15' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D: Dry C Cored W Washed
UD: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thinwall

Proportions Used
trace - 0 to 10%
little - 10 to 20%
some - 20 to 35%
and - 35 to 50%

140 lb Wt x 30" fall on 2" O D Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med Dense; 30-50 Dense; 50 + Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V Stiff; 30 + Hard

SUMMARY:
Earth Boring - 17'
Rock Coring - 0-
Samples - 4

HOLE NO NB-20

MLDN 000687

APPENDIX D

GOLD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

DATE
HOLE NO B-21
LINE & STA
OFFSET
SURF ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO
OUR JOB NO 88-435

GROUND WATER OBSERVATIONS
At ____ after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/18/87	am
COMPLETE	11/18/87	pm
TOTAL HRS.		

BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Per	Rec
		0'-3'	Auger Sample						2" Blacktop-Brown fine to medium SAND & Gravel & Silt (Fill)	1	36"	-
									" ", some Oil			
		5'-7'	D	6	7	7			Black fine to medium SAND & Silt & Cinder (Fill)	2	24"	24"
				7								
								10'				
		10'-12'	D	10	25	39			Brown fine to coarse SAND	3	24"	18"
				59								
		15'-16'6"	D	7	15	100		15'6"		4	18"	18"
								16'6"	Yellow Silty CLAY			
									Bottom of Boring 16'6"			
									Installed (2" PVC) Monitor Well at 15'			
									10'-Slotted			
									5'-Solid			
									4-Bags of Ottawa Sand			
									1/4-Bentonite Balls			
									1/4-Bag of Cement			
									1-Road Box			

GROUND SURFACE TO 15' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D-Dry C-Cored
UP-Undisturbed
TP-Test Pit A-Auger V-Vane Test
UT-Undisturbed

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2" O D Sampler
Cohesionless Density
0-10 Loose
10-30 Med Dense
30-50 Dense
50+ Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30+ Hard

SUMMARY
Earth Borings 16'6"
Rock Coring -0-
Samples 4

HOLE NO B-21

MLDN 000689

Soil Logs

Wellington Properties

Malden, Massachusetts

Test Pit W 8.0

Test pit W 8.0 was excavated 30± feet west and 93 feet from the southern face of the northern Wellington warehouses located at #378 Commercial St. Reference to 1932 Barrett Plan indicates former underground storage in this area.

0.0'	- 0.3'	Bituminous concrete.
0.3'	- 1.7'	Light to dark brown miscellaneous sandy fill with some silts. Gravel and brick fragments; well compacted.
1.7'	- 4.0'	Black stained fine-coarse sand and gravel; mixed with roots and pieces of wood.
4.0'	- 5.3'	Leather scraps, cloth and felt atop of native peat.
5.3'	- 6.0'	Light gray, very fine sandy silt, over marine clay.

Note: Shallow perched groundwater at 3.2', seepage occurs beneath a band of coal tar sediments (2.0' - 3.0'). Leather scraps situated atop peat layer.

Test Pit W 9.0

Test pit W 9.0 was excavated from the western end of W 8.0 and extended southerly through the former underground storage area for approximately 20 feet.

0.0'	- 0.3'	Bituminous concrete
0.3'	- 0.6'	Light brown miscellaneous sandy fill with variable amounts of silt, gravel and brick fragments; well compacted.
0.8'	- 1.5'	Well compacted, dark brown gravel fill with some silt and brick fragments.
1.5'	- 3.3'	Light brown sandy gravel.
3.3'	- 4.8'	Organic sediments mixed with gravel fill, distinct band of coal tar fractions atop a denser layer of native peat and leather scraps.

Test Pit W 9.0 (Continued)

4.8'	- 6.3'	Fibrous cloth material: felt, shoe leather, leather strips; and broken red brick amidst organic sediments. Dry peat layer beneath cloth material.
6.3'	+	Very fine sandy silts blending into marine clay. Upper layer contains marsh/reed grass.

Note: Surface runoff exits beneath excavation from the asphalt with groundwater seepage noted at 4'±. Indications of coal tar fractions most prevalent in 3.3' - 4.8' depth interval; gravel fill with sheening of groundwater seepage noted.

Test Pit W 10.0

Test pit W 10.0 was excavated at the northern end of W 9.0 and extended westerly.

0.25'	- 1.0'	Clean, brown, sandy gravel fill.
1.0'	- 2.75'	Dark brown gravel fill mixed with organic sediments.
2.75'	- 4.5'	Black stained gravel fill, significant coal tar fraction atop transition to organic fill and peat layer. Unconnected 2" distribution piping and electric conduits contained within fill material.
4.5'	- 6.5'	Wooden barrel slats, leather scraps, hides; distinct red leather deposits, organic sediments at a depth of 4' at a distance of approximately 38 feet from the eastern limit of TP W 10.0, a lens of chalky white material 10" - 12" in thickness was encountered amongst the organic fill material. Field observations suggest the presence of an arsenic deposit atop the native peat layer extending in a westerly direction. Further excavations in this direction were terminated to avoid the vehicle access way to Wellington Truck Storage.
6.5'	- 7.0'+	Dry native peat layer blending into gray silts and marine clays.

Note: Surface runoff beneath the asphalt and groundwater seepage at 4'±. Groundwater exhibits slight coal tar sheen and odor. Fill contains electrical conduit sections, 2" pipe distribution lines, organic waste materials.

Test Pit W 11.0

Test pit W 11.0 was excavated in a southerly direction, approximately twelve feet from the western end of TP W 10.0 to investigate probable indications of pile caps and location of former tank storage.

0.0'	- 0.3'	Bituminous concrete
0.3'	- 3.0'	Miscellaneous gravel fill with pieces of red brick.
3.0'	- 4.5'	Dark black stained gravel fill, residual coal tar fractions.
4.5'	- 6.0'	Organic fill material; leather scraps, hides, marine sediments.
6.0'+		Dry marine peat blending into gray clay.

Note: Surface runoff beneath the asphalt with groundwater seepage at 4'±. Groundwater exhibits slight coal tar sheen and odor. The presence of wooden piles detected immediately below pavement; consistent with surface variations in grade.

Test Pit W 12.0

Test pit W 12.0 was excavated approximately 28 feet to the south of the northern Wellington building and 37 feet to the west of southern warehouse extension, to investigate a former process pipe drain and collection trench.

0.0'	- 0.2'	Bituminous concrete.
0.2'	- 0.8'	Brown sandy fill, trace of gravel.
0.8'	- 3.0'	Brown fine to coarse sands; well compacted, some gray staining. Visible, heavy localized coal tar accumulation northeast corner of test pit.
3.0'	- 6.0'	Fine to coarse sands, some gravel; groundwater seepage.
6.0'	+	Dry, brown marine peat atop gray silts and clay.

Note: Shallow groundwater seeps in at 1.5' and 3.0', light sheen and odor typical of coal tar residuals. No recoverable bulk fractions noted; well installed.

Test Pit W 13.0

Test pit W 13.0 was excavated 30± feet to the west of the Wellington warehouse and approximately 30 feet to south of test pit W 12.0, extending in a westerly direction.

0.0'	- 0.3'	Bituminous concrete.
0.3'	- 1.0'	Red peastone gravel.
1.0'	- 1.5'	Bituminous concrete.
1.5'	- 3.0'	Black, heavily stained sandy fill material.
3.0'	- 3.4'	Dark brown silty sands/peat.
3.4'	- 6.0'	Light brown silty sand, marine deposits and peat.

Note: Surface water enters this excavation rapidly from beneath the asphalt; seepage atop compacted silts/peat. The highest accumulation of coal tars were noted at this location, within the upper fill.

Test Pit W 14.0

Test pit W 14.0 was excavated 124 feet south of #378 Commercial Street warehouse, adjacent to TRC test pit W 3.0.

0.0'	- 0.2'	Bituminous concrete.
0.2'	- 0.4'	Brown fine to medium sand with trace light brown gravel.
0.4'	- 0.6'	Bituminous concrete.
0.6'	- 1.5'	Light brown fine to medium sand with gravel.
1.5'	- 1.7'	Bituminous concrete.
1.7'	- 3.0'	Light brown fine to medium sand with gravel; presence of concrete and red brick. Black stained fill material, silty fine to coarse sands in 2.8' to 3.0' depth interval.
3.0'	- 6.0'	Miscellaneous demolition rubble. Brick, concrete, etc. Silt, sand. Sulfur odor.
6.0'	- 6.8'	Marsh grass, miscellaneous organic material and silts.
6.8'	- 11.5'	Fibrous brown-green silty peat and roots.
11.5'	- 12.0'	Medium brown, very fine to medium sand; aggregate subangular to angular quartz.

Note: Groundwater enters rapidly at 11.5', below peat layer.

Test Pit W 15.0

Test pit W 15.0 was excavated 25± feet west of test pit W 14.0 on the westerly side of TRC TP W 3.0.

0.0'	- 0.3'	Bituminous concrete.
0.3'	- 1.3'	Dark brown fine to medium gravel fill.
1.3'	- 2.0'	Brown fine to medium sands and gravel fill, with traces of brick, less gravel than above.
2.0'	- 2.2'	Bituminous concrete.
2.2'	- 3.0'	Light brown fine to coarse sands, some rounded pebbles.
3.0'	- 4.0'	Dark gravel fill.
4.0'	- 5.0'	Silty fine sands, organic sediments, roots.

Note: Excavated 1" copper water line at 5.0'±. No groundwater, coal tar seepage at 3.0'.

Test Pit W 16.0

Test pit W 16.0 was excavated approximately 65 feet and 85 feet south of #378 Commercial Street, in an area of former underground storage of gasoline and kerosene.

0.0'	- 0.2'	Bituminous concrete.
0.2'	- 0.9'	Light brown fine to medium sand; well compacted, round aggregate.
0.9'	- 1.5'	Dark brown fine to medium sandy gravel.
1.5'	- 2.2'	Brown fine to medium sands.
2.2'	- 8.0'	Dark brown fine to medium sandy gravel fill, with 3/4" rebar, 2" pipe sections and bricks.
8.0'	- 9.0'	Brown silty fine sand; peat.
9.0'	- 10.0'	Brown fine to coarse sand and gravel.

Note: No groundwater recovery observed. Test pit excavation extended easterly from the initial north-south trench cut to expose similar soil profile and no indications of underground storage.

Test Pit W 17.0

Test pit W 17.0 was excavated in the southwest corner of the trucking yard, approximately 400± feet west and 225± feet south of the northern warehouse, in an area formerly occupied by a sand filter bed.

0.0'	- 1.0'	Light brown fine-medium gravel; some red stone-3/4" aggregate.
1.0'	- 2.5'	Black trashy fill. Wood, pipes, torn metal, red brick, copper wire, boulders, cast iron pipe sections.
2.5'	- 8.0'	Brown fine to coarse sandy gravel fill, with dark staining and trace of silt. Some concrete and red brick fragments.
8.0'	- 8.1'	Marsh grass.
8.1'	- 10.0'±	Dark brown-black silt with organic fibers.

Note: At 5'± inflow of groundwater from well graded gravel along northwestern corner of test pit, reflects piping of infiltrated surface water or trapped groundwater due to variation in fill deposition.

Test Pit W 18.0

Test pit W 18.0 was excavated as an extension of W 17.0 approximately 5± feet further southwest.

0.0'	- 1.3'	Light brown processed gravel.
1.3'	- 3.5'	Black trash. Wood, pipes, torn metal, red brick, copper wire, boulders, cast iron pipe sections.
3.5'	- 6.0'	Loose silty sandy fill material atop miscellaneous debris; including tires, automobile seat, metal scraps.
6.0'	- 9.0'	Marsh grass with peat.
9.0'	- 10.0'	Gray silts, fine sands, trace clay.

Note: Groundwater enters from southwest corner of excavation at approximately 7.5' with a noticeable blue green petroleum sheening.

Test Pit W 19.0

Test pit W 19.0 was excavated from southwest end of W 17.0 in a southerly direction and revealed a predominance of miscellaneous fill material similar in depth and type to that observed in TP W 18.0.

Test Pit W 20.0

Test pit W 20.0 was excavated from the southwest end of W 18.0 southwesterly.

0.0' -	1.3'	Light brown processed gravel.
1.3' -	3.0'	Black trashy fill consisting of wood, pipes, metal scrap, red brick, copper wire, boulders, cast iron pipe.
3.0' -	9.5'	Gray organic silts mixed with fine-medium sands atop native peat.

Note: No unusual odors noted.

Test Pit W 21.0

Test pit W 21.0 was excavated 300± feet west and 240± feet south of #378 Commercial Street.

0.0' -	0.2'	Bituminous concrete.
0.2' -	3.0'	Light brown, medium to coarse sandy fill. Sloping profile to south with intermittent lens of light brown silty sand, roots and sticks.
3.0' -	3.5'	Wedge of dark, medium to coarse sand and gravel, sharp, angled aggregate.
4.5' -	5.5'	Medium brown sand and fine gravel.

Note: Groundwater enters at 5'± with black color and coal tar sheen. Eastern side of test pit revealed a trashy fill lens from 0.2' - 2.0'± containing ashen debris, red brick, wood and sandy gravel fill. A black asphalt deposit was encountered at 2' along with red brick fragments and an old electrical insulator. Soils below 3' are well graded and stratified sloping southerly.

Test Pit W 22.0

Test pit W 22.0 was excavated 200± feet west and 200 feet south of #378 Commercial Street.

0.0'	- 0.4'	Bituminous concrete.
0.4'	- 1.0'	Brown, medium to coarse sandy gray fill.
1.0'	- 1.5'	Variable brown, fine to coarse sandy fill containing bricks, metal scrap.
1.5'	- 2.5'	Dipping bed of solidified asphalt along bed of former shoreline.
2.5'	- 5.0'	Organic fill material with some gravel.
5.0'	- 7.5'	Fine to coarse sandy gravel fill with residual coal tar fractions.
7.5'	- 8.5'	Peat blending into gray silty fine sands; trace of clay.

Note: Groundwater seepage at 5.1'± with typical coal tar odor and sheen. Substantial coal tar product atop native peat layer. Installed temporary 3" PVC recovery well.

Test Pit W 23.0

Test pit W 23.0 was excavated approximately 75 feet north and 140 feet west of southwest corner of the building #378, 20± feet from edge of Little Creek and soil test boring S-22.

0.0'	- 0.2'	Bituminous concrete.
0.2'	- 1.0'	Light brown, fine to medium sands and gravel.
1.0'	- 9.0'	Light brown, fine to coarse sand and gravel fill mixed with peat and ash; 3/4" diameter rebar sections, concrete slabs, metal scrap, brick.
9.0'	- 10.0'	Light brown, very fine silty sands and trace of organic matter atop peat.

Note: Groundwater enters at 4.0'±, black color, visible sheen and heavy coal tar/petroleum odor. Significant coal tar accumulation noted.

Test Pit W 24.0

Test pit W 24.0 was excavated 30 feet south and 55 feet east of W 23.0 to evaluate former stream bed pathway through the site.

0.0' - 0.3'	Bituminous concrete.
0.3' - 1.1'	Very light brown, fine to medium silty sandy gravel fill.
1.1' - 2.0'	Black stained, very fine sand, silt lens.
2.0' - 6.5'	Black, fine to medium sandy gravel fill with sections of roofing material and black tar.
6.5' - 16.3'	Marsh grass, brown-yellow peat with intermittent deposits of shells, silt, fine to medium sands and coarse sand.

Note: Rapid groundwater infiltration at 15.5'; distinct sulfide and coal tar odors noted.

Test Pit W 25.0

Test pit W 25.0 was excavated 130 feet west and 125 feet south of the ell corner of the #378 warehouses, adjacent to previous W 3.0 excavation.

0.0' - 0.2'	Bituminous concrete.
0.2' - 0.9'	Medium brown, fine gravel fill.
0.9' - 2.1'	Bituminous concrete.
2.1' - 3.7'	Black, mixture of medium gravel, ash, brick and slag cemented together in very dense layer.
3.7' - 4.9'	Dark brown-red, sandy gravel fill; some leather scrap.
4.9' - 6.0'	Wedge of white spongy material.
6.0' - 11.0'	Peat, marsh grass blending into gray silty fine sands, trace clay.

Note: No groundwater infiltration. At 4.9', encountered 1"copper water line.

Test Pit W 26.0

Test pit W 26.0 was excavated approximately 42' to the south of the southeast corner of #378 Commercial Street; adjacent to former well MW4.

0.0'	- 0.4'	Bituminous concrete.
0.4'	- 0.9'	Light brown fine gravel with oxide staining; and red brick fragments.
0.9'	- 3.0'	Dense organic silts with fine to coarse sands and gravel; some cobbles.
3.0'	- 5.0'	3/4" graded stone.
5.0'	- 6.0'	Brown-dark brown marsh grass and peat mixed with fine to coarse sand; trace fine gravel.

Test Pit W 27.0

Test pit W 27.0 was excavated 250'± south and 90'± east of northeast corner of the warehouses, in the vicinity of the former pier area; trench cut in a northwesterly direction.

0.0'	- 0.5'	Light brown fine to medium processed gravel.
0.5'	- 8.0'	Black stained organic silts with fine to coarse sandy gravel fill and miscellaneous debris; well compacted, large blocks, brick, wood, glass, granite curbs and rebar.

Note: Distinct coal tar odor to black stained fill.

Test Pit W 28.0

Test pit W 28.0 was excavated at the southeast end of W 27.0 to investigate the extent of miscellaneous fill material.

0.0'	- 4.0'	Light brown, fine to medium processed gravel.

Note: Typical of W 27.0, predominantly construction debris. No groundwater infiltration.

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

DATE
HOLE NO S-22
LINE & STA.
OFFSET
SURF ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At ____ after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size, D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/18/87	am/pm
COMPLETE	11/18/87	am/pm
TOTAL HRS.		
BORING FOREMAN	C. Broullette	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Per	Rec
		0'-3'	Auger Sample						Black fine to medium SAND & Gravel, some Silt & Cobbles (Fill) Glass, Wood, Brick (Strong Coal Tar Odor noted at 1'6")	1	36"	-
		3'-5'	D	3	3	4				2	24"	6"
				5								
		8'-10'	D	10	11	12				3	24"	2"
				14				10'				
		10'-12'	D	1	1	1			Brown fine SAND & Silt, trace of Fiber & Coal Tar	4	24"	18"
				1				13'				
		13'-15'	D	2	2	2			PEAT & organic Silt &	5	24"	18"
				2								
		15'-17'	D	2	2	2			Coal Tar	6	24"	24"
		17'-19'	D	2	2	4				7	24"	12"
				3				19'				
									Bottom of Boring 19'			
									Installed (2" PVC) Monitor Well at 15'			
									5'-Solid 6-Bags of Ottawa Sand 1/4-Box of Bentonite Balls 1/4-Bag of Cement 1-Road Box (used respiration)			

GROUND SURFACE TO 15' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D-Dry C-Cored W-Washed
UP-Undisturbed Piston
TP-Test Pit A-Auger V-Vane Test
UT-Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2 O.D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med Dense; 30-50 Dense; 50+ Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V Stiff; 30+ Hard

SUMMARY
Earth Boring 19'
Rock Coring -0-
Samples 7

HOLE NO NB-22

MLDN 000700

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE R I

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO
OUR JOB NO 88-435

DATE
HOLE NO S-23
LINE & STA
OFFSET
SURF ELEV

GROUND WATER OBSERVATIONS
At 2' after Hours
At after Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size - D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/19/87	am pm
COMPLETE	11/19/87	am pm
TOTAL HRS.		
BORING FOREMAN	G. Broullette	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock - color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample					1'	Brown fine to medium SAND & Gravel (Clean Fill)	1	36"	-
		3'-5'	D	1	15	4			Black fine to medium SAND & Gravel & Cinder & Brick, some Glass & Wood & Silt (Fill)	2	24"	12"
				3								
		7'-9'	D	1	1	1		5'6"	Coal Tar mixed in at 3'	3	24"	24"
				1					Gray organic SILT, trace of Fiber			
		15'-17'	D	1	1	1				4	24"	24"
				1				18'				
		20'-22'	D	1	1	2			PEAT	5	24"	24"
				2				22'				
									Bottom of Boring 22' Installed (2" PVC) Monitor Well at 15'			
									15'-Slotted 5' Solid 9-Bags of Ottawa Sand 1/4-Bentonite Balls 1/4-Bag of Cement 1-Road Box & Respirators			

GROUND SURFACE TO 20' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D: Dry C Cored W Washed
UP - Undisturbed Piston
TP - Test Pit A - Auger V Vane Test
UT - Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt x 30" fall on 2 O.D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med Dense; 30-50 Dense; 50+ Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V Stiff; 30+ Hard

SUMMARY
Earth Boring 22'
Rock Coring -0-
Samples 5

HOLE NO NB-23

MLDN 000701

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE R I

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO
OUR JOB NO 88-435

DATE
HOLE NO S-24
LINE & STA
OFFSET
SURF ELEV

GROUND WATER OBSERVATIONS
At ____ after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/19/87	am pm
COMPLETE	11/20/87	am pm
TOTAL HRS.		
BORING FOREMAN	G. Broullette	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample					2"	BLACKTOP	1	36'	-
								1'	Brown fine to medium SAND & Gravel & Silt			
								3'	Black fine SAND & organic Silt & (Coal Tar Odor)			
		3'-4'	D	1	3	-		4'	Gray silty CLAY, (Fill)	2	12'	12"
		4'-5'	D	-	4	3			Black & Brown fine to medium	2A	12'	12"
								6'	SAND mixed with organic Silt some Fiber			
		7'-9'	D	1	1	1			organic SILT, trace of Fiber	3	24"	24"
				1								
								13'				
		13'-14'6"	D	1	1	1		14'6"	Black organic SILT, trace of Gray fine Sand	4	18"	18"
		14'6-15'	D	-	-	10				4A	6"	6"
								18'	Black & Gray fine to medium SAND (trace of organic to none at tip of Spoon)			
									Gray organic SILT, trace of Fibers PEAT	5	24"	24"
		20'-22'	D	1	1	2						
				3								
								25'				
		25'-27'	D	1	2	2			Gray fine SAND & Silty Clay	6	24"	24"
				13				27'	on Layers			
									Bottom of Borings 27'			
									Installed (2" PVC)			
									Monitor Well at 25'			
									10'-Slotted			
									15'-Solid			
									9-Bags of Ottawa Sand			
									1/2-Box of Bentonite Balls			
									1-Road Box			
									Respirator			

GROUND SURFACE TO 25 USED H/S/A CASING THEN S/S to Bottom

Sample Type:
D: Dry C: Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2 O.D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med Dense; 30-50 Dense; 50+ Very Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 8-15 Stiff; 15-30 V-Stiff; 30+ Hard

SUMMARY
Earth Borings 27'
Rock Coring -0-
Samples 6

HOLE NO B-24

MLDN 000702

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1

TO Norwood Engineering | ADDRESS Norwood, Mass.

PROJECT NAME Monitor Wells @ Town DPW- | LOCATION Malden, Mass.

REPORT SENT TO Above / DPW Way | PROJ NO

SAMPLES SENT TO Taken At Site | OUR JOB NO 88-435

DATE

HOLE NO S-25

LINE & STA

OFFSET

SURF ELEV.

GROUND WATER OBSERVATIONS

At ____ after ____ Hours

At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11-20-87	am
COMPLETE	11-20-87	pm
TOTAL HRS.		

BORING FOREMAN G. Broullette

INSPECTOR

SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From C-6	To 6-12	To 12-18	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
									Drilled to 8'			
								8'	Installed (2" PVC) Monitor Well at 8' 5'-Slotted 5'-Solid 4-Bags of Ottawa Sand 1/4-Bentonite Balls 1/2-Cement 1-Road Box Respirator 1-Gate Box			

GROUND SURFACE TO 8' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D: Dry C: Cored W: Washed
UP: Undisturbed Piston
TP: Test Pit A: Auger V: Vane Test
UT: Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V. Stiff
		30 +	Hard

SUMMARY
Earth Borings 8'
Rock Coring -0-
Samples -

HOLE NO S-25

MLDN 000703

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO S-26
LINE & STA.
OFFSET
SURF. ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO.
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At 6' in River after ___ Hours
At ___ after ___ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11-20-87	a.m. p.m.
COMPLETE	11-20-87	a.m. p.m.
TOTAL HRS.		
BORING FOREMAN	G. Broullette	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample						Brown fine to medium SAND & organic Silt (Fill) Boulder in Fill	1	36"	-
		3'-3'6"	D	100/0"				5'		-	6"	0"
		5'-7'	D	2	3	5			Black Coal Tar, some Silt & Clay mixed in Fill (strong odor noted)	2	24"	12"
				10				10'				
		10'-12'	D	1	1	2			Black & Brown organic SILT, trace of Fibers & Gray fine Sand	3	24"	12"
				1				14'				
		15'-17'	D	1	1	4			Grayish fine SAND & organic Silt, trace of Peat Fibers mixed	4	24"	18"
				3				18'				
		20'-21'6"	D	1	1	1			Gray organic SILT, trace of Fibers	5	18"	18"
		21'6"-22'	D	-	-	1		21'6"	Brown PEAT, trace of fine Sand	5A	6"	6"
								24'				
		25'-27'	D	1	2	2			Gray silty CLAY, trace of fine Sand in Lenses	6	12"	24"
								27'				
									Bottom of Boring 27'			
									Installed (2" PVC) Monitor Well at 13'			
									10'-Slotted 5'-Solid 12-Bags of Ottawa Sand 1/2-Box of Bentonite Balls 1/2-Bag of Cement 1-4" Riser & Cap & Lock Respirator			

GROUND SURFACE TO ___ USED H/S/A CASING THEN S/S to Bottom

Sample Type
D-Dry C-Cored W-Washed
UD-Undisturbed Piston
TP-Test Pit A-Auger J-Jume Test

Proportions Used
Trace 0 to 10%
Little 10 to 20%
Some 20 to 35%

140 lb Wt. x 30" fall on 2" O.D. Sampler
Cohesionless Density: 0-10 Loose; 10-30 Med Dense
Cohesive Consistency: 0-4 Soft; 4-8 M/Stiff; 30+ Hard

SUMMARY
Earth Boring 27'
Rock Coring -0-
Samples 6

MLDN 000704

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET - OF -
DATE
HOLE NO S-27
LINE & STA.
OFFSET
SURF. ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO.
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At _____ after _____ Hours
At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I.D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11-23-87	a.m.
COMPLETE	11-23-87	p.m.

TOTAL HRS.
BORING FOREMAN G. Broullette
INSPECTOR
SOILS ENGR.

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From	To 6"-12"	To 12"-18"	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample					2'6"	Black fine to medium SAND & Cinder (Fill)	1	36"	-
		3'-5'	Auger Sample						Black & Gray organic SILT (Fill) & (coal-tar odor noted) & fine Sand, trace of Fibers	2	24"	-
		5'-7'	D	1	1	1				3	24"	24"
				1				9'				
		10'-12'	D	1	6	4			Gray fine to medium SAND, some organic Silt & Fiber	4	24"	24"
				8				15'				
		15'-17'	D	5	6	7		17'	Gray silty Clay & fine Sand in Layers	5	24"	24"
				8					Bottom of Boring 17'			
									Installed (2" PVC) Monitor Well at 15'			
									15'-Slotted 5'-Solid 8-Bags of Ottawa Sand 1/4-Bentonite Balls 1/2-Bag of Cement 1-Road Box Respirator			

GROUND SURFACE TO 15' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D-Dry C-Cored W-Washed
UP-Undisturbed Piston
TP-Test Pit V-Auger V-Vane Test
UT-Undisturbed Thinwall

Proportions Used
Trace 0 to 10 %
Little 10 to 20 %
Some 20 to 35 %
Used 35 to 50 %

140 lb Wt x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY
Earth Boring 17'
Rock Coring -0-
Samples 5

HOLE NO B-26

MLDN 000705

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO S-28
LINE & STA.
OFFSET
SURF. ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO.
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At 10' on Rods after ___ Hours
At ___ after ___ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/23/87	a m
COMPLETE	11/23/87	p m
TOTAL HRS.		a m
BORING FOREMAN C. Broullette		p m
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample					2"	Cement	1	36"	-
								1'6"	Clean Brown fine to medium SAND & Gravel			
									Black fine to medium SAND & Cinder & Coal Tar & Gravel			
		5'-7'	D	10	13	15				2	24"	24"
				29								
								10'				
		10'-11'	D	3	3	-			Gray & Black CLAY &	3	12"	12"
								11'	organic (Fill)			
		11'-12'	D	-	1	3			Black organic SILT &	3A	12"	12"
								13'	Cinder & Fiber PEAT			
								16'	PEAT	4	12"	12"
		15'-16'	D	1	1	-			Organic SILT & Peat	4A	12"	12"
		16'-17'	D	-	1	2			" ", trace of Peat			
		20'-22'	D	1	1	1			Gray organic SILT & fine Sand , trace of fibers & sea shells mixed	5	24"	24"
				1								
		25'-27'	D	1	1	1				6	24"	24"
				1								
		30'-32'	D	1	1	1		31'		7	24"	24"
				1					Gray fine to medium SAND			
								35'				
		35'-37'	D	4	6	7			Gray silty Clay	8	24"	24"
				10				37'				
									Bottom of Boring			

GROUND SURFACE TO 35 USED H/S/A CASING THEN S/S to Bottom

Sample Type
O-Dry C-Cored A-Auger
UP-Undisturbed Piston
TP-Test Pit V-Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140lb Wt x 30" fall on 2 0 0 Sampler
Cohesionless Density
0-10 Loose
10-30 Med Dense
30-50 Dense
50+ Very Dense

Cohesive Consistency
0-4 Soft 30+ Hard
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff

SUMMARY 37
Earth Boring
Rock Coring 8
Samples

HOLE NO

MLDN 000706

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO S-29
LINE & STA.
OFFSET
SURF. ELEV.

TO Norwood Engineering
PROJECT NAME Monitor Wells @ Town DPW-
REPORT SENT TO Above / DPW Way
SAMPLES SENT TO Taken At Site

ADDRESS Norwood, Mass.
LOCATION Malden, Mass.
PROJ NO.
OUR JOB NO. 88-435

GROUND WATER OBSERVATIONS
At 8' after ____ Hours
At ____ after ____ Hours

	CASING	SAMPLER	CORE BAR
Type	H/S/A	S/S	
Size I.D		1-3/8"	
Hammer Wt		140#	BIT
Hammer Fall		30"	

	Date	Time
START	11/23/87	am pm
COMPLETE	11/23/87	am p.m.
TOTAL HRS.		
BORING FOREMAN	G. Broullette	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc	SAMPLE No	Pen	Rec
		0'-3'	Auger Sample					1'6"	Brown fine to coarse SAND & Gravel (Fill)	1	36"	-
		5'-7'	D	49 60	40	59		9'	Black fine to medium SAND & Cinder & Silt (Fill) & Boulders	2	24"	6"
		10'-12'	D	3 7	4	5		15'6"	Black organic SILT & some Sand & Coal Tar	3	24"	6"
		15'-15'6	D	1	-	-				4	6"	6"
		15'6-17'	D	1	1	5		17'	PEAT			
									Bottom of Boring 17'			

GROUND SURFACE TO 15' USED H/S/A CASING THEN S/S to Bottom

Sample Type
D Dry C Cored W Washed
UP Undisturbed Piston
SS Split Spoon A Auger V Vane Test

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%

140lb Wt x 30" fall on 2" O.D Sampler
Cohesionless Density
0-10 Loose
10-30 Med Dense
30-50 Dense

Cohesive Consistency
0-4 Soft 30 + Hard
4-8 M/Stiff
8-15 Stiff

SUMMARY
Earth Boring 17'
Rock Coring -0-
Samples 4
HOLE NO

MLDN 000707

APPENDIX E

CONAM INSPECTION

Testing Laboratories

East Natick Industrial Park
6 Huron Drive • Natick, MA 01760
(617) 235-7330, 653-5950
Telex 948459 GREENELAB NTIK

Research • Development

Branch Laboratories:
Springfield, Mass. 01109 (413) 734-6548
Auburn, Mass. 01501 (617) 832-5500

CONAM INSPECTION a unit of Dynacorp
California, Texas, Illinois, Pennsylvania, Ohio

D: NORWOOD ENGINEERING CO.
1410 ROUTE ONE
NORWOOD MA 02062
TN:
AMPLE ID: 4 SOIL SAMPLES

DATE: 12/15/87
JOB NO. 3223-1
LAB NO. 7212
DECK.W07-P1
ORDER NO. D0065
DATE REC'D: 12/7/87

MATERIAL: SOIL
BOOK NO. 325-45-68
SPECIFICATIONS:

	"C" D0065-NB22-S5	"D" D0065-WELLIS-S25	"A" D0065-NB23-S2	"B" D0065-NB27-S3
Free Cyanide (mg/kg)	1.02	2.28	3.86	6.19
Total Cyanide (mg/kg)	<1.41	4.11	44.9 *	1.87 **
Arsenic (mg/kg)	5.225	3.453	--	--
Phenol (mg/kg)	<2.20	--	<2.38	--

Note: * Average of 3 results.

** Interference, positive or negative, could not be determined.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS
15TH DAY OF DECEMBER 1987
ARNOLD GREENE TESTING LABORATORIES
DIVISION OF CONAM INSPECTION

Geoffrey A. Coelho, Manager

CONAM INSPECTION

Testing Laboratories

East Natick Industrial Park
6 Huron Drive • Natick, MA 01760
(617) 235-7330, 653-5950
Telex 948459 GREENELAB NTIK

Inspection • Evaluation • Analysis
Research • Development

Branch Laboratories:
Springfield, Mass. 01109 (413) 734-6548
Auburn, Mass. 01501 (617) 832-5500

CONAM INSPECTION a unit of Dynacon
California, Texas, Illinois, Pennsylvania, Ohio

NORWOOD ENGINEERING CO
1410 ROUTE ONE
NORWOOD MA 02062
ATTN:

DATE: 12/15/87
JOB NO. 3223-1
LAB NO. 7212
DECK.W07-P2
ORDER NO. 00065

MATERIAL: WATER
BOOK NO. 322-40 SJ
SPECIFICATIONS: EPA METHOD 624

SAMPLE ID: 2 WATER SAMPLES
1. 00065-59

DATE REC'D: 12/4/87

DATE ANALYZED: 12/11/87

COMPOUND	QUANT. ION	CONC. UG/L	COMMENTS
Chloromethane		ND	
Dichlorodifluoromethane		ND	
Bromomethane		ND	
Vinyl Chloride		ND	
Chloroethane		ND	
Methylene Chloride		ND	
Trichlorofluoromethane		ND	
1,1-Dichloroethylene		ND	
1,1-Dichloroethane		ND	
1,2-Dichloroethylene Isomers		ND	
Chloroform		ND	
1,2-Dichloroethane		ND	
1,1,1-Trichloroethane		ND	
Carbon Tetrachloride		ND	
Bromodichloromethane		ND	
1,2-Dichloropropane		ND	
1,3-Dichloropropene Isomers		ND	
Trichloroethylene		ND	
Dibromochloromethane		ND	
1,1,2-Trichloroethane		ND	
2-Chloroethylvinyl Ether		ND	
Bromoform		ND	
Benzene	78	TRACE	
Tetrachloroethylene		ND	
1,2,2,2-Tetrachloroethane		ND	
Toluene	91	TRACE	
Chlorobenzene		ND	
Ethylbenzene	91	TRACE	
Acrolein		ND	
Acrylonitrile		ND	
Non-Priority Pollutants:			
Xylenes Total		ND	
1H-Indene	116	Tentatively Present	

KEY: J= Approximation.
D= Concentration is lower than detection level because of compounds more sensitive.
ND=None Detected.

Priority Pollutants
DETECTION LEVELS (ppb) 25

**Acrolein & Acrylonitrile 125

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS
15TH DAY OF DECEMBER 1987
ARNOLD GREENE TESTING LABORATORIES
DIVISION OF CONAM INSPECTION

James J. Baril, Manager

CONAM INSPECTION

Testing Laboratories

East Natick Industrial Park
6 Huron Drive • Natick, MA 01760
(617) 235-7330, 653-5950
Telex 948459 GREENELAB NTIK

Research - Development

Branch Laboratories:
Springfield, Mass. 01109
(413) 734-6548

Auburn, Mass. 01501
(617) 832-5500

CONAM INSPECTION a unit of Dynacon
California, Texas, Illinois, Pennsylvania, Ohio

TO: NORWOOD ENGINEERING CO. DATE: 12/31/87 MATERIAL: WATER

1410 ROUTE ONE JOB NO. 3223-2 BOOK NO. 326-8-JB

NORWOOD, MA 02062 LAB NO. 7212 SPECIFICATIONS: NONE
DECU.W01-P1

ATTN: ORDER NO. D0065

SAMPLE ID: 2 SOIL - 2 WATER SAMPLES DATE REC'D: 12/7/87 EXTRACTED: 12/8/87 ANALYZED: 12/15/87

PURPOSE: To determine the presences of and quantification of any Base/Neutral or Acid Extractable compounds.

METHOD: The samples were liquid/liquid extracted in accordance with the EPA's Analytical procedure for Base/Neutral Extractable compounds and Acid Extractable compounds. The extracts were then analyzed by Gas Chromatographic/Mass Spectrometric technique. (EPA Method 625)

This sample(s) was tested for all the compounds on the enclosed list(s).

All compounds except those listed below were non-detected.

RESULTS:

#1. MW 1 (Water)	UG/L
Naphthalene	5.5
Acenaphthylene	3.4
Acenaphthene	42
Fluorene	52
Phenanthrene	48
Anthracene	5.6
Fluoranthene	4.3
Pyrene	4.7
Chrysene	Trace

COMMENT: The detection limit is 10 ug/l.

#2. S-22 (Water)	UG/L
Naphthalene	17,310
Acenaphthylene	189
Acenaphthene	523
Fluorene	670
Phenanthrene	1380
Anthracene	523
Fluoranthene	497
Pyrene	376
Chrysene	306

Detection Limit is 1,000 ug/l.

CONAM INSPECTION

Testing Laboratories

East Natick Industrial Park
6 Huron Drive • Natick, MA 01760
(617) 235-7330, 653-5950
Telex 948459 GREENELAB NTIK

Inspection • Evaluation • Analysis
Research • Development

Branch Laboratories:
Springfield, Mass. 01109 (413) 734-6548
Auburn, Mass. 01501 (617) 832-5500

CONAM INSPECTION a unit of Quanex
California, Texas, Illinois, Pennsylvania, Ohio

PURPOSE: To determine the presences of and quantification of any Base/Neutral or Acid Extractable compounds.

METHOD: The samples were soxhlet/soxhlet extracted in accordance with the EPA's Analytical procedure for Base/Neutral Extractable compounds and Acid Extractable compounds. The extracts were then analyzed by Gas Chromatographic/Mass Spectrometric technique. (EPA Method 625)

This sample(s) was tested for all the compounds on the enclosed list(s).

All compounds except those listed below were non-detected.

TP 22 (old #5)

RESULTS: #3. S-25 (Soil) @ 7.5

	mg/kg Wet weight
Naphthalene	935
Acenaphthylene	Trace
Acenaphthene	120
Fluorene	247
Phenanthrene	973
Anthracene	518
Fluoranthene	373
Pyrene	259
Benzo(A)anthracene	519
Benzo(b)Fluorene	270
Benzo(a)pyrene	466
Indeno(1,2,3-cd)pyrene	Trace

COMMENT: The detection limit is 300 mg/kg wet weight.

#4. S-26 (Soil) (TP 6 old) W3

Naphthlene	1480
Acenaphthylene	276
Fluorene	350
Phenanthrene	1100
Anthracene	190
Fluoranthene	286
Pyrene	209
Chrysene	254

The detection limit is 400 mg/kg wet weight.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS
31ST DAY OF DECEMBER 1987
ARNOLD GREENE TESTING LABORATORIES
DIVISION OF CONAM INSPECTION

James J. Barril, Manager

CONAM INSPECTION

Testing Laboratories

East Natick Industrial Park
6 Huron Drive • Natick, MA 01760
(617) 235-7330, 653-5950
Telex 948459 GREENELAB NTIK

Inspection • Evaluation • Analysis
Research • Development

Branch Laboratories:
Springfield, Mass. 01109 (413) 734-6548
Auburn, Mass. 01501 (617) 832-5500

CONAM INSPECTION a unit of Dynalectron
California, Texas, Illinois, Pennsylvania, Ohio

: NORWOOD ENGINEERING CO
1410 ROUTE ONE
NORWOOD MA 02062
K:

DATE: 12/15/87
JOB NO. 3223-1
LAB NO. 7212
DECK.W07-P3
ORDER NO. D0065

MATERIAL: WATER
BOOK NO. 322-40-SJ
SPECIFICATIONS: EPA METHOD 624

SAMPLE ID: WATER SAMPLE D0065-S22

DATE REC'D: 12/4/87

DATE ANALYZED: 12/11/87

COMPOUND	QUANT. ION	CONC. UG/L	COMMENTS
Chloromethane		ND	
Dichlorodifluoromethane		ND	
Bromomethane		ND	
Vinyl Chloride		ND	
Chloroethane		ND	
Methylene Chloride		ND	
Trichlorofluoromethane		ND	
1,1-Dichloroethylene		ND	
1,1-Dichloroethane		ND	
1,2-Dichloroethylene Isomers		ND	
Chloroform		ND	
1,2-Dichloroethane		ND	
1,1,1-Trichloroethane		ND	
Carbon Tetrachloride		ND	
Bromodichloromethane		ND	
1,2-Dichloropropane		ND	
1,3-Dichloropropene Isomers		ND	
Trichloroethylene		ND	
Dibromochloromethane		ND	
1,1,2-Trichloroethane		ND	
2-Chloroethylvinyl Ether		ND	
Bromoform		ND	
Benzene	78	631	
Tetrachloroethylene		ND	
1,2,2,2-Tetrachloroethane		ND	
Toluene	91	544	
Chlorobenzene		ND	
Ethylbenzene	91	214	
Acrolein		ND	
Acrylonitrile		ND	
Non-Priority Pollutants:			
Xylenes Total	91	648	

KEY: J= Approximation.
D= Concentration is lower than detection level because of compounds more sensitive.
ND=None Detected.

Priority Pollutants
DETECTION LEVELS (ppb) 25

**Acrolein & Acrylonitrile 125

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS
15TH DAY OF DECEMBER 1987
ARNOLD GREENE TESTING LABORATORIES
DIVISION OF CONAM INSPECTION

James J. Baril, Manager

CONAM INSPECTION

Testing Laboratories

East Natick Industrial Park
6 Huron Drive • Natick, MA 01760
(617) 235-7330, 653-5950
Telex 948458 GREENELAB NTIK

Research • Development

Branch Laboratories:
Springfield, Mass. 01109
(413) 734-6548

Auburn, Mass. 01501
(617) 832-5500

CONAM INSPECTION
California, Texas, Illinois, Pennsylvania, Ohio

D: NORWOOD ENGINEERNG CO.

1410 ROUTE ONE

NORWOOD, MA 02062

ATTN:

SAMPLE ID: 4 WATER SAMPLES

DATE: 12/23/87

JOB NO. 3666-1

LAB NO. 7253
DECQ.WOS-PS

ORDER NO. 0065-02

DATE REC'D: 12/15/87

MATERIAL: WATER

BOOK NO. 327-45-DE

SPECIFICATIONS:

Sample	Total Cyanide (ug/l)
B0065-NB22	0.03
B0065-NB23	0.08
B0065-NB26	1.66
B0065-NB27	0.65

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS
23RD DAY OF DECEMBER 1987
ARNOLD GREENE TESTING LABORATORIES
DIVISION OF CONAM INSPECTION

Geoffrey A. Coelho, Manager

APPENDIX A

Interim Work Plan - Data Acquisition
Malden, Massachusetts

Wellington Property

(*) 1. Delineation of Bulk - free floating coal tars.

a. Minimum of six test pit excavations in the area of test pits W-3, W-4 and B-11, with additional investigation along the northern property line adjacent to the main building.

b. Base Neutral (625) analysis on representative soil samples.

c. Representative 624 analysis for volatile organic compounds.

d. Recovery of bulk free floating coal tars through localized remediation.

e. Transmissivity/permeability studies in areas of possible groundwater recovery.

(*) 2. Investigation of possible arsenic deposits during item (1) test pit excavations and removal to approved off site disposal facilities.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 5. Concentrations of Volatile Organic Compounds

(Method 602 Modified)[1]

Client: TRC Environmental Consultants, Inc.
CAA Project No.: 85-276

Date Samples Received: April 5, 1985
Date Analysis Completed: April 19, 1985

Compound	Sample ID: / CAA ID:	Concentration - ug/kg (ppb)[2] MW-1 8501186	TP-4 8501187	MW-3 8501188
(1) benzene		40	2,300	280
(2) toluene		24	1000	90
(3) ethyl benzene		88	15,000	
(4) total xylenes		300	32,000	72
Detection Limit		8	50	6

[1] Modified by use of a flame ionization detector.

[2] Concentrations less than the detection limit are left blank.